LARGEST TELEPHONE CIRCULATION IN THE WORLD.

UNIV. OF MICHI
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Telephony.

AN ILLUSTRATED MONTHLY TELEPHONE JOURNAL

VOLUME I.
NUMBER 6.

CHICAGO, JUNE, 1901.

10 CENTS A COPY.
50 CENTS A YEAR.

INDEPENDENT
TELEPHONE SUPPLY COMPANY
TELEPHONE CONSTRUCTION SPECIALTIES
AND SUPPLIES
19 SOUTH CANAL STREET, CHICAGO.

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THIS ADV. IS WORTH $1.00 TO YOU.

If you will send us $2.00 we will send you a sample pair of DONNELLY CLIMBERS and Give You Free a $1.00 Set of our best Straps with Pads complete. This offer is limited. Climbers are warranted equal to any make. If not satisfactory you can have your money back. Mention this paper.

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MAGNETO BELLS.

Efficiency, Material and Workmanship Guaranteed.

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TELEPHONE SUPPLIES

PROMPT SHIPMENTS
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WATER MOTORS
For driving Telephone Generators in Telephone Exchanges.

Over one hundred of these motors in use by the Central Union Telephone Company. Address

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172 S. CLINTON ST., CHICAGO, ILL.
ESTABLISHED 1889

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85 W. VAN BUREN ST.,
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MANUFACTURERS OF
LINEMEN'S CONSTRUCTION TOOLS.

WRITE TO-DAY FOR OUR
"RED BOOK"
It is of pertinent interest to every telephone man and will be sent free upon request.

ARE YOU LOOKING FOR TROUBLE?
IF SO, GET A COPY OF
TELEPHONE TROUBLES
AND HOW TO FIND THEM
On both Magneto and Common Battery Systems. 8th Edition Just Out. Price 25c. Liberal discounts to agents.
For sale by TELEPHONY, Manhattan Building, CHICAGO.

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CHICAGO, ILLINOIS.
WRITE FOR OUR REFERENCES.

OHM'S LAW

Gold-plated watch charm, oxidized silver cuff and lapel buttons, sent postage prepaid on receipt of 25 cents each or 50 cents for set, with books explaining all laws of electricity and rules of practice.

ROLFE ELECTRIC CO.,
355 Wells St., Chicago, Ill.
OWNERS OF
Barrett and Rolfe Patents on Lightning Arresters. Sneak and Strong Current Protectors for telephone and telegraph wire and instrument protection.
Approved by Board of Fire Underwriters, International Association of Fire Engineers, and International Association of Municipal Electricians.

Alphabetical Index to Advertisers, Page XXXV.

EUREKA ELECTRIC CO.

WRITE

FOR

Our NEW TELEPHONE and SUPPLY CATALOG and we will send you

FREE-GRATIS

Inside view No. 1 Special Transmitter.

a model of our well-known special No. 1 transmitter, which has no equal, and incidentally remember our line of Telephone and Switchboard apparatus is the largest in the world, and is manufactured in the most Model Factory on Earth.

Our large line embraces Central Energy Systems; Magneto Systems; Toll Line Systems; Express Switchboards; Flash Light and Multiple Switchboards and Telephones for all purposes, series bridged and inter-communicating.

SEND FOR CATALOG.

143-145 SOUTH CLINTON ST., CHICAGO, U. S. A.

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Mail Order Factory

GUARANTEES ITS PRODUCT
FOR SIX YEARS.

Every Type of Telephone and Switchboard is Made Under One Roof and Sold Exclusively by Mail at Reasonable Prices.

SECURE QUOTATIONS AND SAMPLES BEFORE PLACING ORDERS.

Write for Our List of Recent Testimonials.

Electrotypes for stationery, either Cross or Shield, furnished free on application.

A specialty is made of everything necessary to equip and install a modern up-to-date exchange or toll line.

The CHICAGO name-plate guarantees the highest state of the art.

Chicago Telephone Supply Co.

OFFICE AND FACTORY:

Canal and Washington Streets, CHICAGO.

KELLOGG

SWITCHBOARD & SUPPLY CO.,

CHICAGO, ILL.

The Kellogg Switchboard & Supply Company was organized in 1897 and has had from the start the highest reputation as to the efficiency of the apparatus manufactured by it. Its apparatus has gained this enviable opinion by its merits which was the certain result of the efforts of the corps of engineers to which was entrusted the design of the circuits and apparatus. Another factor tending to produce the result was the liberal and fair policy adopted toward its operatives which attracted to the employ of the company the best operatives and experimental mechanics in the country. The interest and intelligence of the men in general have frequently been remarked upon by visitors, many of whom were themselves large employers of labor. Each of these things, together with the most ceaseless watchfulness and attention to detail, has placed the company in the front rank of telephone manufacturers in this country and in Europe.

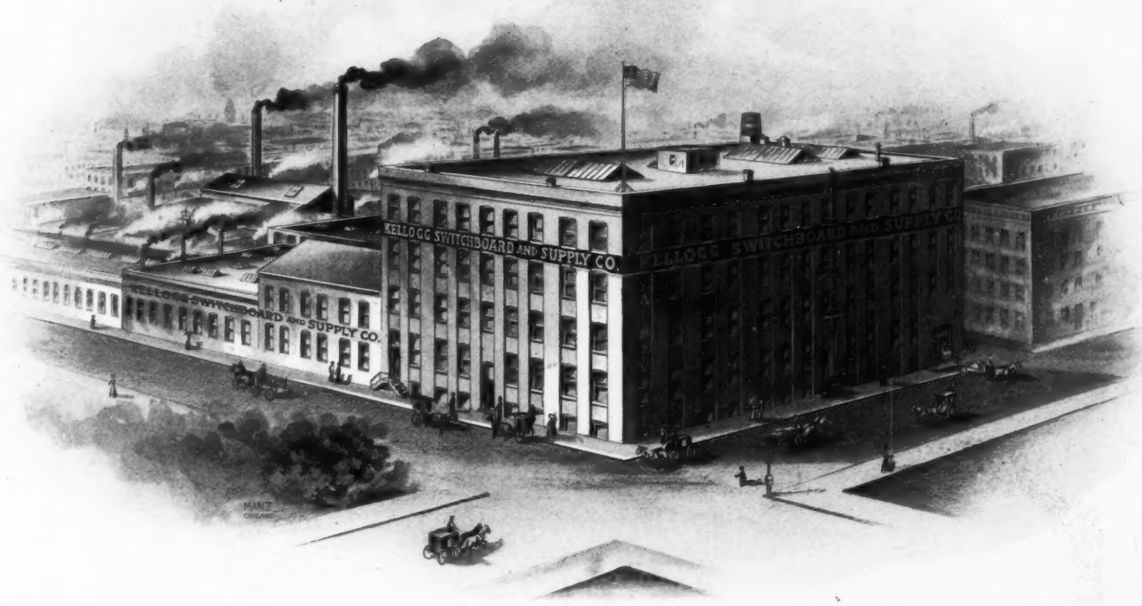
The construction of the switchboards and telephones for practically all the large independent exchanges operating in the United States at the present day has been entrusted to this company, and the success of every one of these and the quality of the service given speaks sufficiently for the apparatus. As showing the magnitude of this one line of work done by the company it may be stated that six of the multiple switchboards installed by this company average no less than 6,300 lines present equipment.

The company has throughout its career kept abreast of the advance in the art. It anticipated every other independent manufacturer in the use of double lamp supervision by more than a year, and had installed several straight lamp signal switchboards before any other manufacturer had arrived at the point of offering this system.

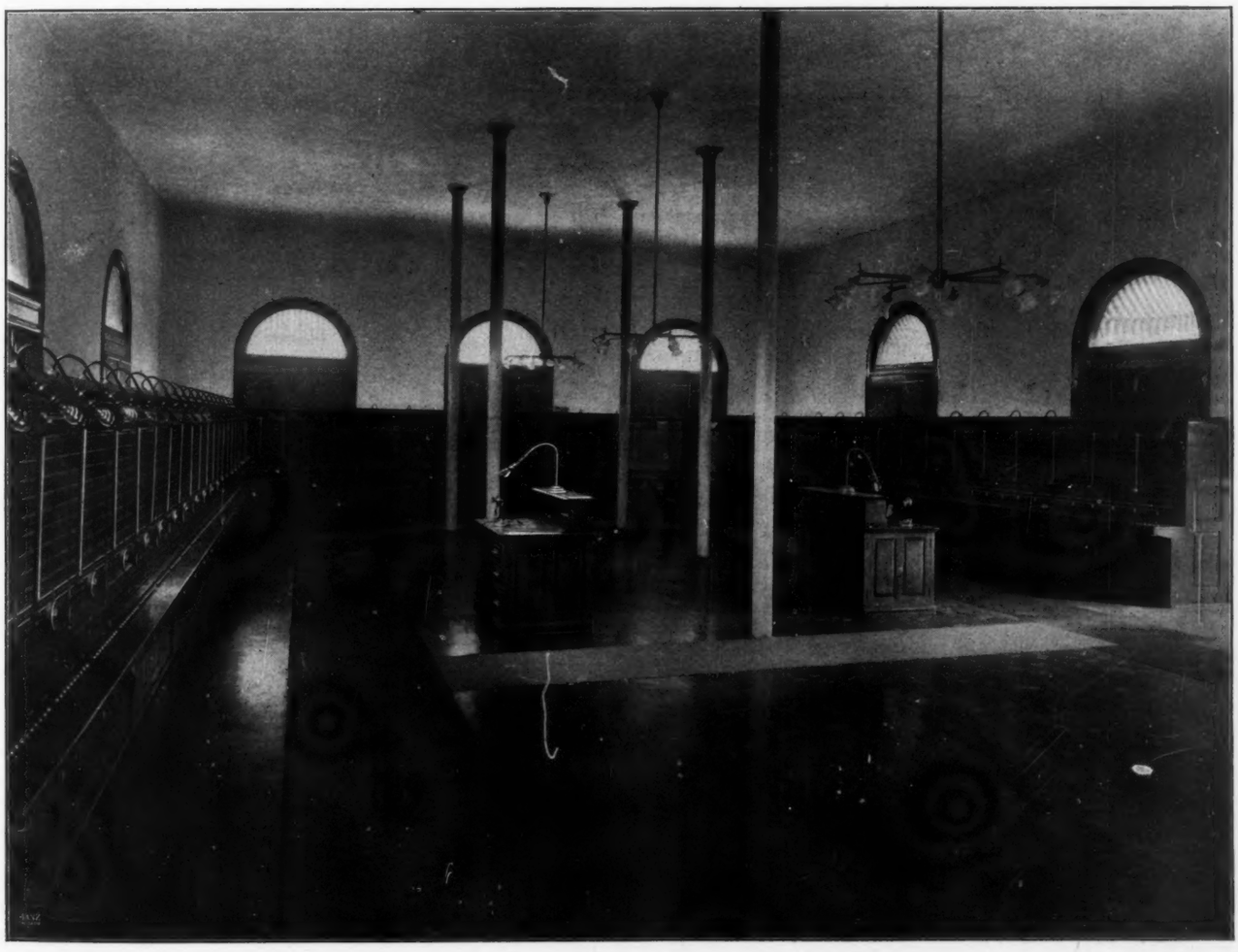
The fact that accounts for this is simply that the company maintains at a large expense a staff of telephone engineers, whose ability relieves the company from the necessity of following others but permits it to lead well in advance. This corps is being continually added to by the employment of the best talent. Among them are men of national reputation as Messrs. Dunbar, Miller, Dommerque and Dean.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Factory and General Offices:



S. W. Cor. Congress and Green Sts. Chicago.

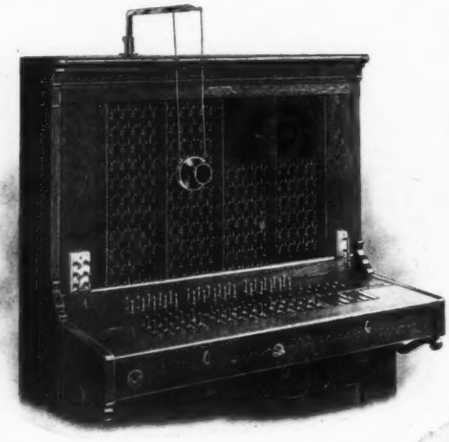


Operating Room of the Pittsburg and Allegheny Telephone Co. Main Exchange, Pittsburg. Complete Central Battery System. Double Lamp Supervision. Present Equipment 4,160 Lines. Installed by Kellogg Switchboard & Supply Company.

Kellogg Switchboard & Supply Co.

CHICAGO, ILLINOIS.

Last summer we put on the market the best Self-Restoring Drop Magneto Switchboard ever built. Its reception by purchasers shows tha the best is appreciated. Write us about it.



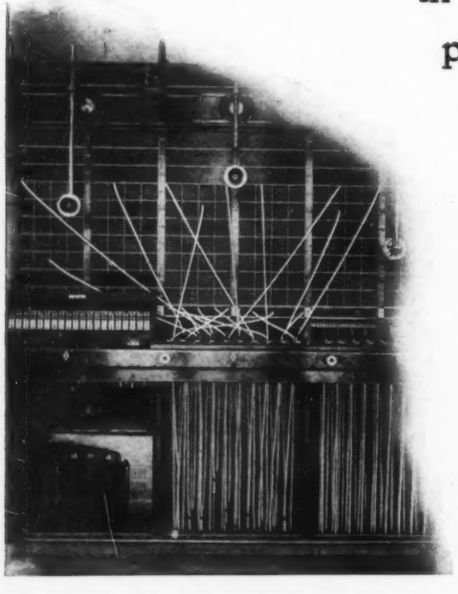
250 LINE SELF-RESTORING DROP BOARD.

We show on these two pages our apparatu assembled and in detail. We believe description to be unnecessary and that the design of the apparatus will convey the impression we wish you to receive.

BRIDGING TELEPHONE WITH KELLOGG PAY STATION.

You are cordially invited to visit our exhibit in Section R of the Electrical Building at Buffalo, where our representatives will take pleasure in showing most complete line of telephone apparatus ever exhibited.

SERIES TELEPHONE COMPACT TYPE



CLOSE VIEW OF PITTSBURG SECTION.

PRIVATE BRANCH-EXCHANGE SWITCHBOARD.

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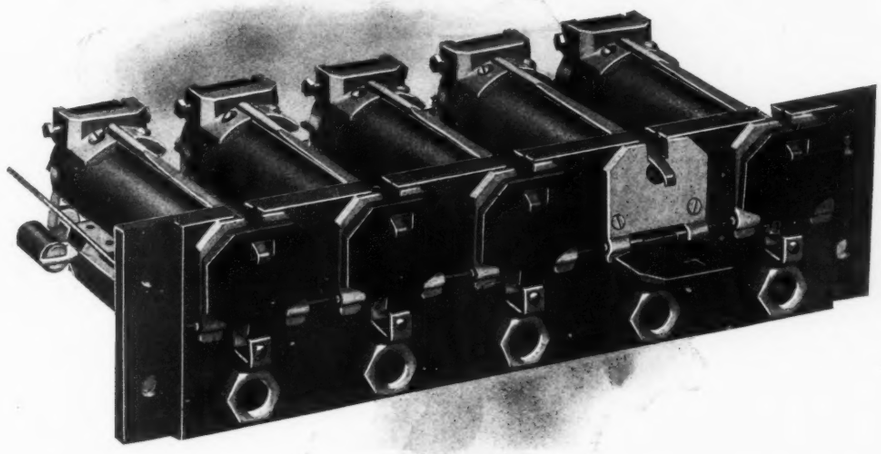
Kellogg Switchboard & Supply Co.

CHICAGO, ILLINOIS.

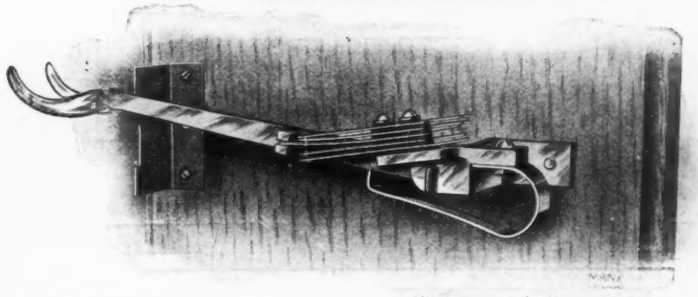
Combined Self-Restoring Drops and Jacks.



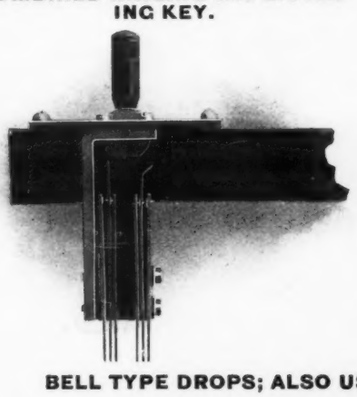
Mounted five per strip upon iron, faced with polished hard rubber.

RECEIVER PARTS.

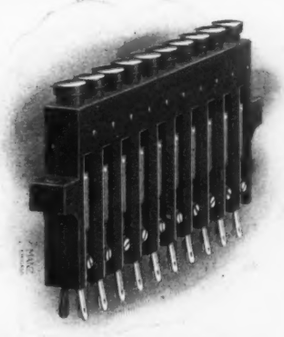
KELLOGG HOOK SWITCH.



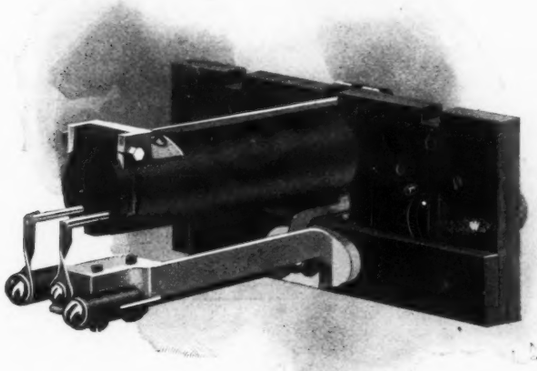
COMBINED RINGING and LISTENING KEY.



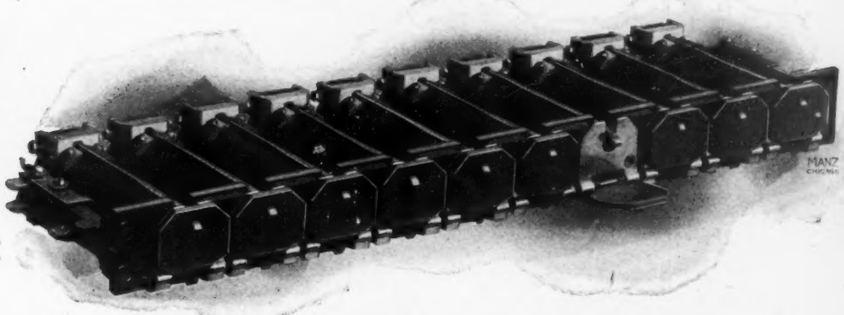
ORDER WIRE KEYS.



REAR VIEW COMBINED DROP AND JACK.



BELL TYPE DROPS; ALSO USE FOR CLEARING OUT.



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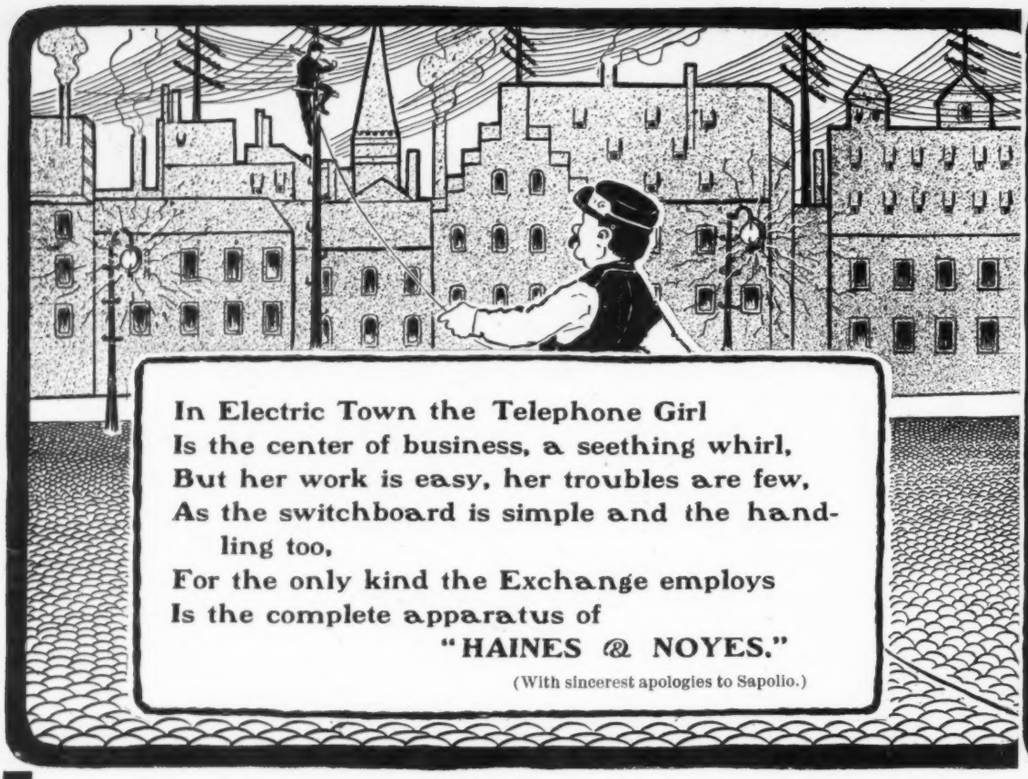


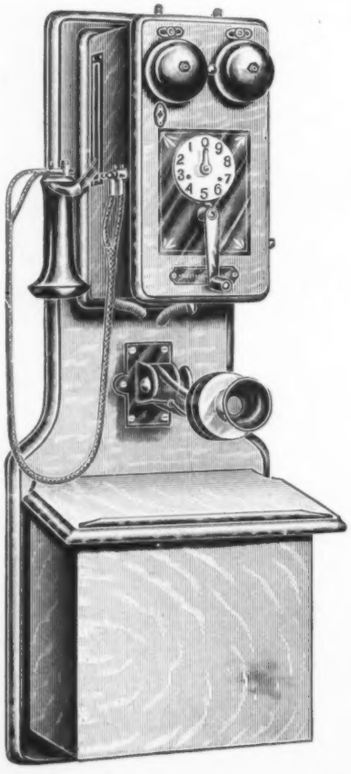
In Electric Town the Telephone Girl
Is the center of business, a seething whirl,
But her work is easy, her troubles are few,
As the switchboard is simple and the handling too,
For the only kind the Exchange employs
Is the complete apparatus of
"HAINES & NOYES."

(With sincerest apologies to Sapolio.)

THE HAINES &

Agents for Minnesota:
E. M. Van Duzee Jr. & Co.,
St. Paul - Minneapolis.

118-132 WEST JACKSON BLVD.,



An investment that pays is what no doubt you are looking for. Come to us we have it in the

National Automatic Telephone

AND

Selective Party Line Phones.

Also remember we make, and sell right,

Bridging and Series Phones.

Of our Series Phones says The Dow Construction Co.:

Baxter Springs, Kas., May 15th, 1901.

"We received the last shipment all right, and have them at work, and need more, so enclose you order for same. Your phones continue to give both our subscribers and ourselves the best of satisfaction."

The National Automatic Telephone Co.,

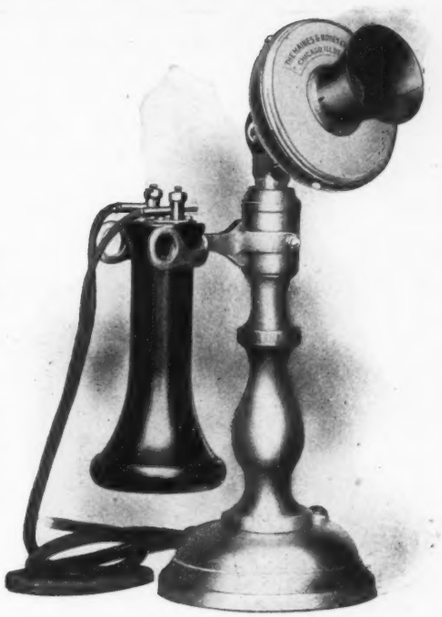
153-155 W. Jackson Boulevard . . . Chicago, Ill.

AT LAST!!

THE PERFECT DESK SET!!

Platinum contacts all in the base—Cannot become corroded or injured in any way—Sure and positive—Heavy cast base and copper upright—Equipped with our "5 A" Adjustable Transmitter with heavy cast brass front and brass parts—Cannot be equaled for volume of sound and clearness of articulation—Our Bipolar "Pony" Receiver with water-shrunk hard rubber shell, of permanent adjustment—For Central Energy or Magneto Call.

Write for full description and prices.
Get our new "SPECIAL OFFER."



"Style 5," Desk Set.

NOYES COMP'Y

CHICAGO, ILL., U. S. A.

INDEPENDENT TELEPHONE SUPPLY COMPANY

We have on hand for immediate delivery
10 Bridging Telephones, $9.50 ea.
50 Series Telephones, 7 50 "
10 Desk Set Telephones, 5.50 "
Above are practically new; in first class condition and of well known make.
Subject to Previous Sale.

TELEPHONE CONSTRUCTION SPECIALTIES AND SUPPLIES

19 SOUTH CANAL STREET, CHICAGO

COMPLETE STOCK *PROMPT SHIPMENTS*

WE HAVE A LARGE STOCK OF **WIRE** GENUINE DBLE. GALVANIZED

"EXTRA B. B.," "B. B." AND "MONARCH."

Hard Drawn Copper Wire. *Galvanized Steel Strand.*

"Boston" Cable Hangers, "Crosby" Clips.

Complete Stock of Telephone Construction Material.
Net Price List Upon Application.

AMERICAN ELECTRIC TELEPHONE CO.

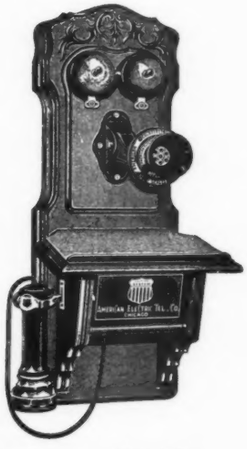
CHICAGO, U. S. A.

AUTHORIZED CAPITAL, THREE MILLION.

LARGEST MANUFACTURERS IN THE WORLD.

MEDAL AWARDED

PARIS 1900.



No. 34. CENTRAL ENERGY TELEPHONE.

1901—AMERICAN FACTORIES AND EXTENSIONS—1901

MANUFACTURER OF

MODERN TELEPHONE APPARATUS.

CONTRACTOR FOR

COMPLETE EXCHANGE EQUIPMENTS

OF ANY MAGNITUDE.

For Particulars and Prices, Address:

AMERICAN ELECTRIC TELEPHONE CO.

36 to 50 Jackson Boulevard, Cor. Canal Street, CHICAGO.

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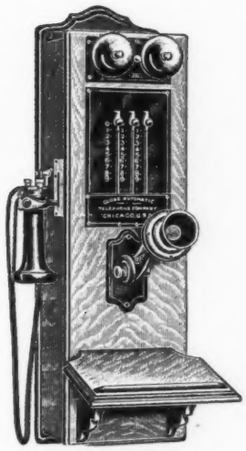
NEW CREATIONS

BORN FROM—IMITATIONS.

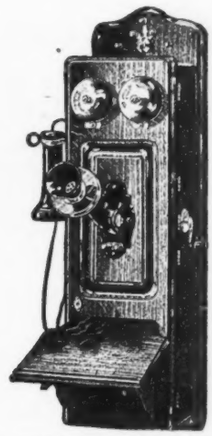
NOTICE: A Design Patent will be obtained and imitators prosecuted. Patents also applied for on our Victor Arrester and removable transmitter used on our No. 36 telephone.

No. 36. AMERICAN—1900.

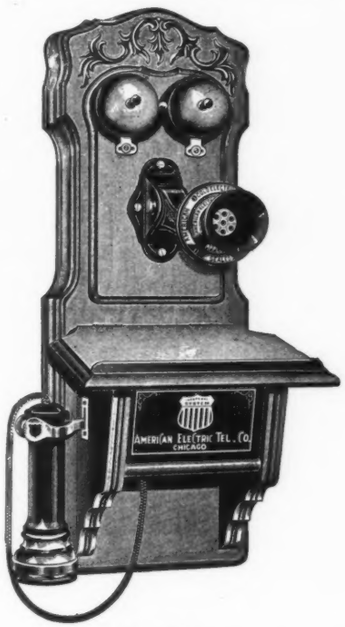


THE WORLD.

THE JEWEL.



THE BRIGHTEST.



No. 34.
CENTRAL ENERGY—1901.

THE FOREIGN.

A MODEL PHONE.

THE CONQUEROR.

NEXT—

OUR No. 36 TELEPHONE, BRIDGING AND SERIES, WAS DESIGNED A YEAR AGO, AND EXHIBITED AT THE PARIS EXPOSITION. SINCE THEN A NUMBER OF IMITATIONS HAVE SPRUNG UP.

CAN THE IMITATION BE AS GOOD AS THE ORIGINAL ?

AMERICAN ELECTRIC TELEPHONE CO.

36 to 50 Jackson Boulevard, Cor. Canal Street, CHICAGO.

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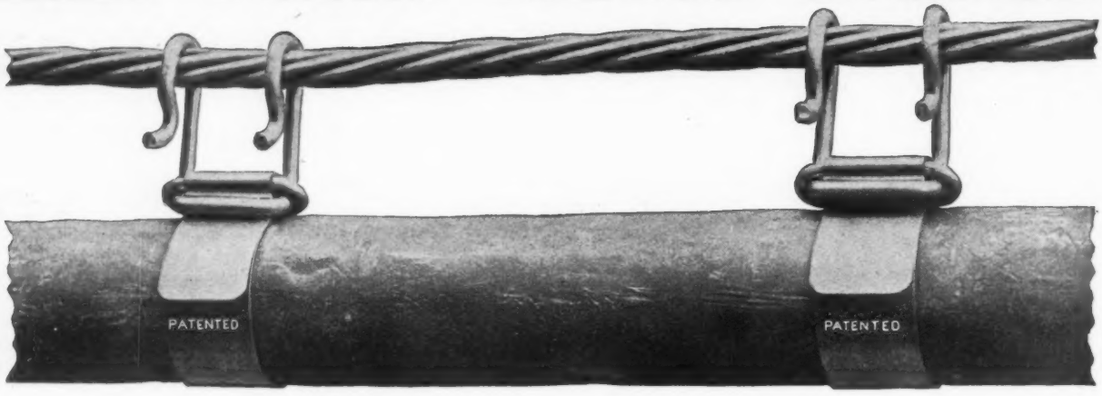
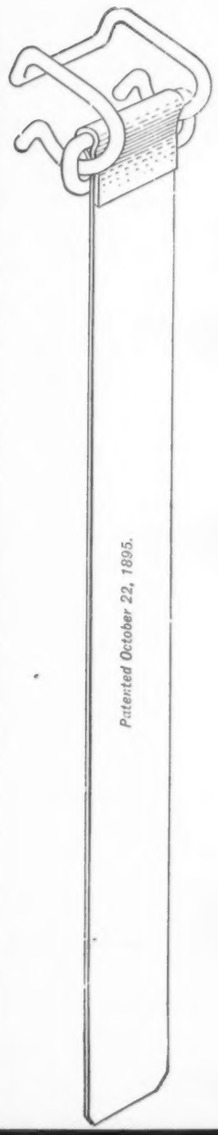
FOR..... HANGING TELEPHONE CABLES





Why don't YOU use

THE "Boston Cable Clip"

TOO?

The largest Telephone Systems in the country are using them EXCLUSIVELY,

BECAUSE

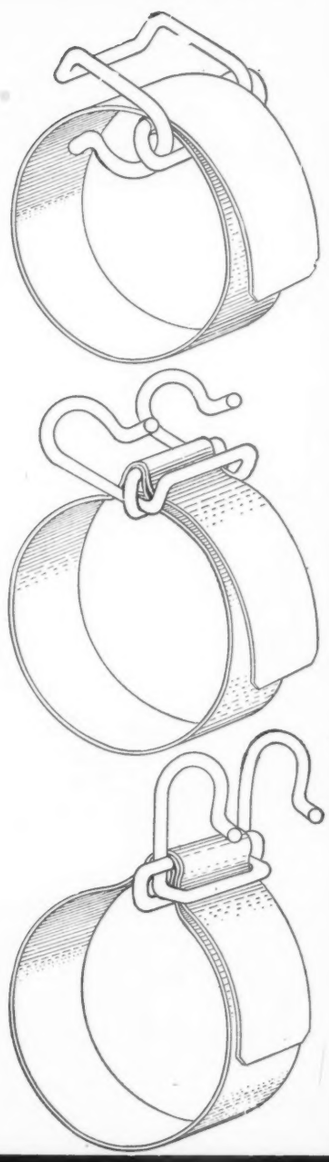
They are the most ECONOMICAL.
They are the most DURABLE.
They are the most EFFICIENT.

BECAUSE

They WILL NOT SLIP.
They are **ADJUSTABLE TO ANY SIZE CABLE.**

MILLIONS IN USE.

LET US TELL YOU ABOUT THEM.



CHASE-SHAWMUT CO.

(SOLE MANUFACTURERS)

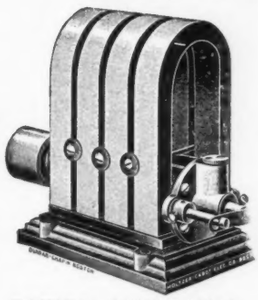
Boston, Mass.

MACOMBER & WHYTE, Western Agents, Chicago, Ill.

QUICK SHIPMENTS.

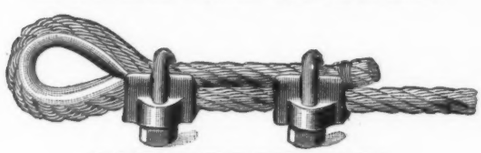
TELEPHONE SUPPLIES.

BRIDGING MAGNETO BELL.



POWER GENERATOR.

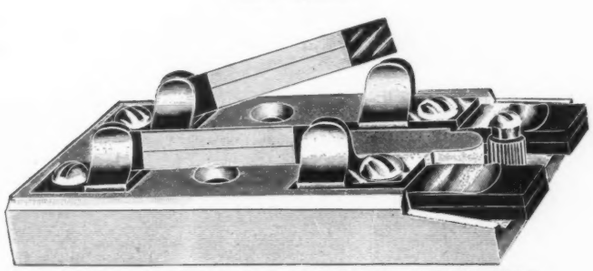
GALVANIZED STEEL WIRE STRAND.



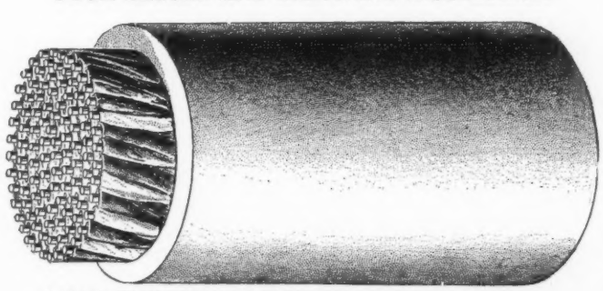
CROSBY WIRE ROPE CLIPS.

CROSS-ARMS.

GUY RODS.



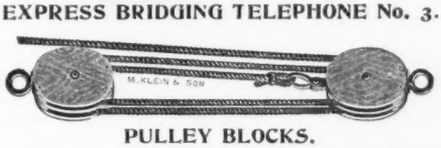
FUSE BLOCKS AND LIGHTNING ARRESTERS.



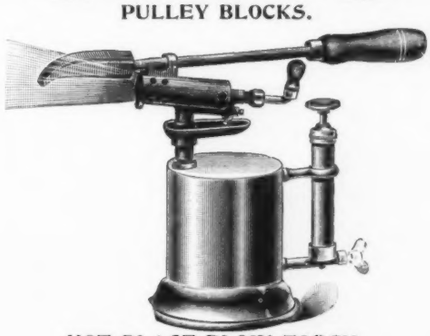
LEAD ENCASED PAPER TELEPHONE CABLES.

CONSTRUCTION MATERIAL.

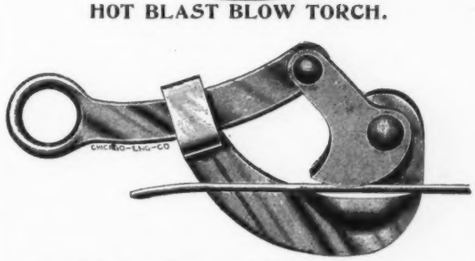
EXPRESS BRIDGING TELEPHONE No. 3.



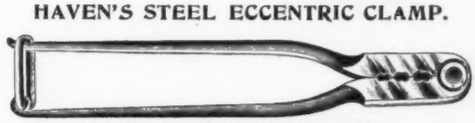
PULLEY BLOCKS.



HOT BLAST BLOW TORCH.



HAVEN'S STEEL ECCENTRIC CLAMP.



KLEIN'S SPLICING CLAMPS.

M. B. AUSTIN & CO., 56 and 58 West Van Buren Street, CHICAGO, ILL.

SEND FOR OUR NO. 7 POCKET CATALOGUE.

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TELEPHONY

will begin a new volume with the

July Number

The subscription price will be raised to

One Dollar per Year.

Subscriptions at the old rate of fifty cents per year will be accepted up to June 30, 1901.

Don't you think you had better SUBSCRIBE NOW?

DETACH THIS BLANK AND MAIL IT. YOU MAY REMIT IN STAMPS.

Chambers, McMeal & Co., Publishers, ...1901.

Manhattan Bldg.
CHICAGO, ILL., U. S. A.

Please send "TELEPHONY" to the following address for.....months

for which we enclose.....cents.

RATES:
50 Cents Per Year
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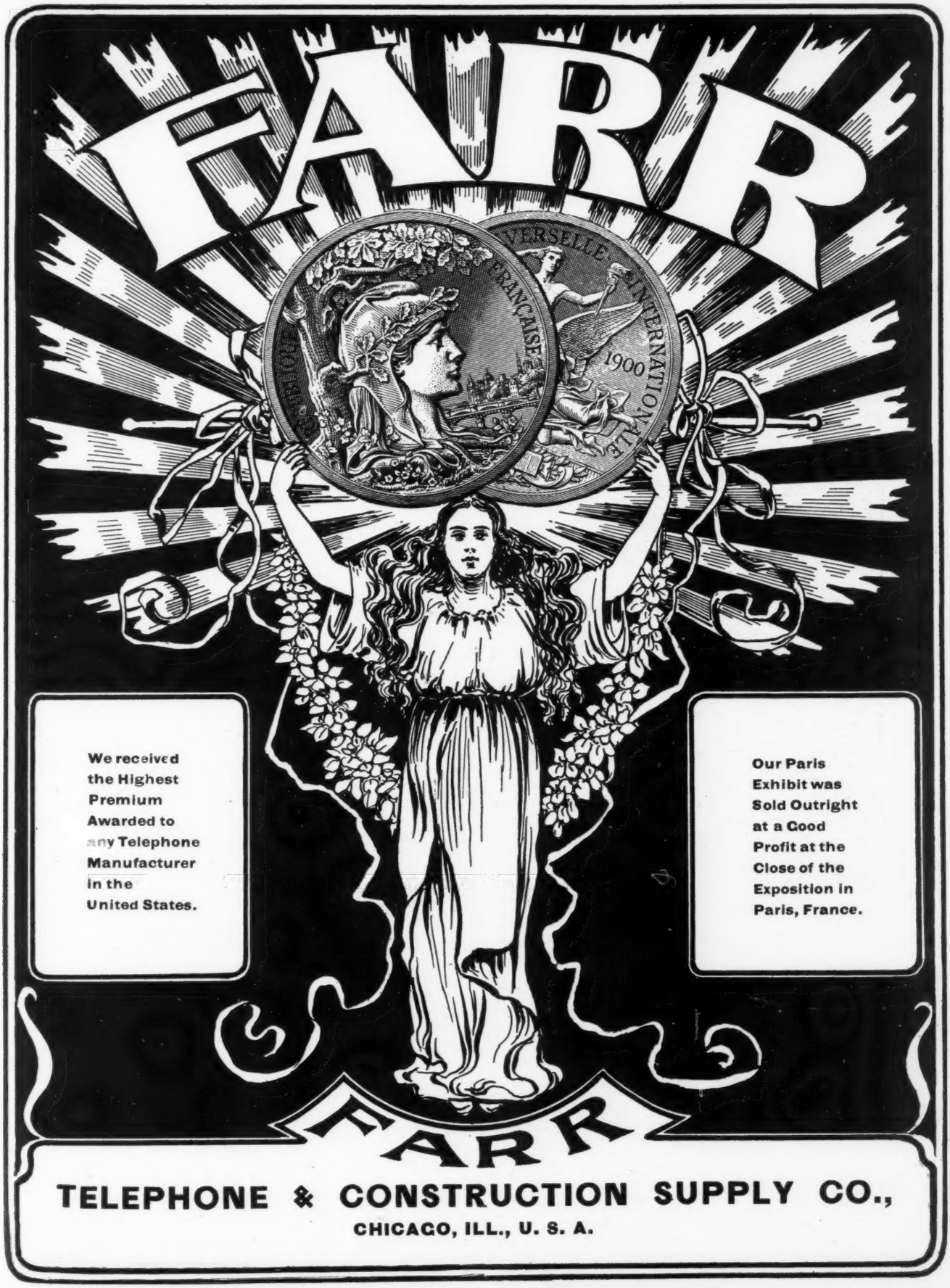
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FRANCAISE
1900
We received the Highest Premium Awarded to any Telephone Manufacturer in the United States.
Our Paris Exhibit was Sold Outright at a Good Profit at the Close of the Exposition in Paris, France.
FARR
TELEPHONE & CONSTRUCTION SUPPLY CO.,
CHICAGO, ILL., U. S. A.

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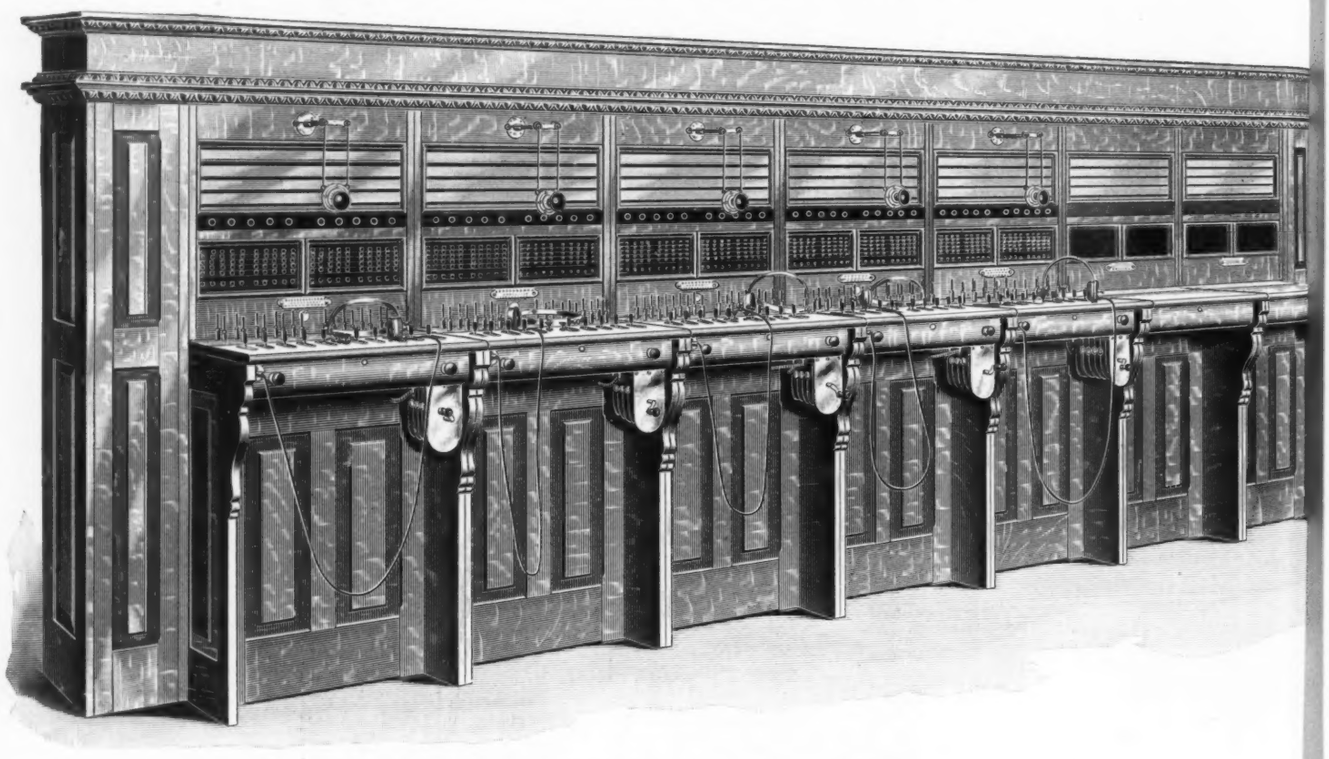
CENTRAL ENERGY TRUNKING

—AND—

MULTIPLE SWITCHBOARDS

FOR ANY SIZE EXCHANGE.



700 CAPACITY, 500-LINE EQUIPPED "CENTRAL ENERGY" TRUNKING SWITCHBOARD.

FURNISHED WITH VISUAL OR LAMP LINE SIGNALS.

THE STROMBERG-CARLSON

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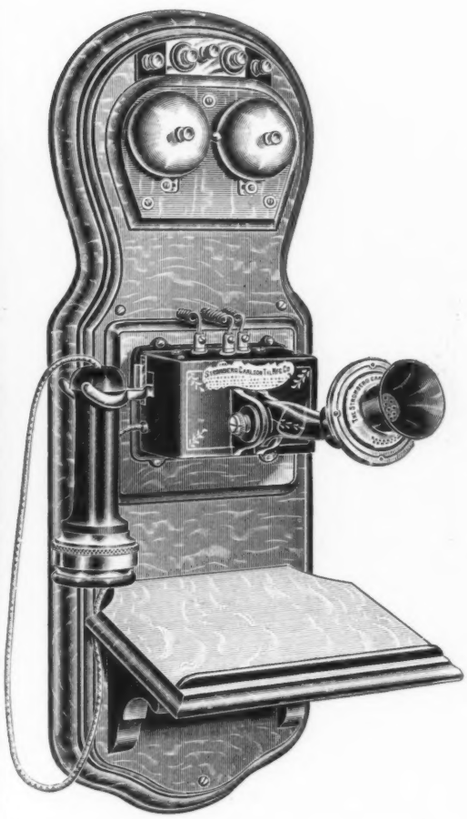
CENTRAL ENERGY TELEPHONES

THAT TALK ANY DISTANCE.



CENTRAL ENERGY WALL TELEPHONE.

THEIR MERITS

HAVE BEEN

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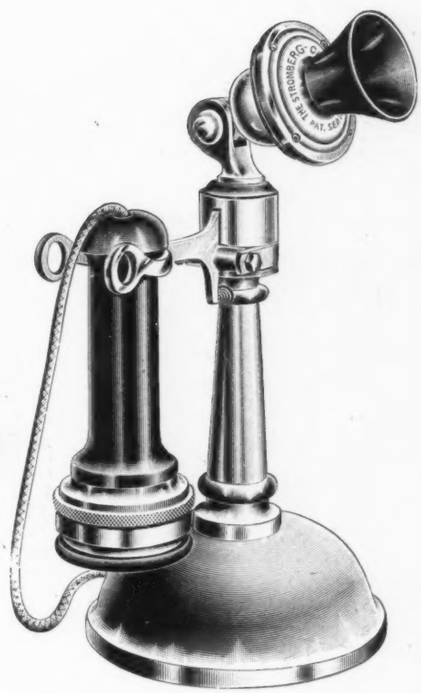
DEMONSTRATED



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THEY STAND UNEQUALED AND NEVER FALL DOWN.

TELEPHONE M'NF'G. CO.

CHICAGO, U. S. A.

GENERATOR TELEPHONES

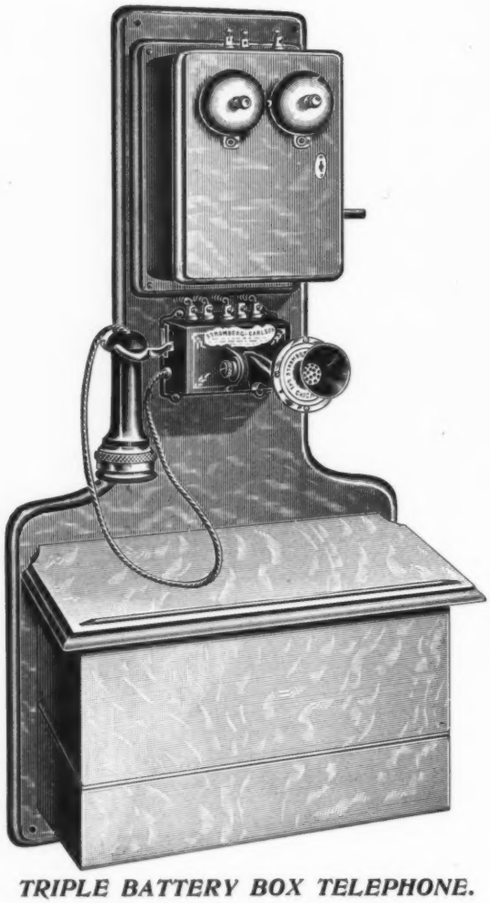
FOR

EXCHANGES AND LONG DISTANCE TOLL LINES.

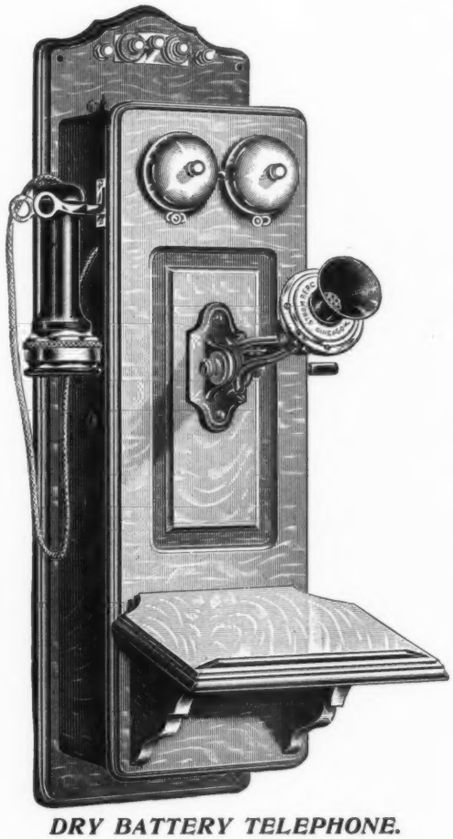
TANDEM TELEPHONE.

TOLL LINE SWITCHBOARDS

And Apparatus A Specialty.



TRIPLE BATTERY BOX TELEPHONE.



DRY BATTERY TELEPHONE.

All Goods Fully Guaranteed.

A full line of construction material always on hand for prompt delivery.

Telephone Plants Constructed Complete.

The Stromberg-Carlson Tel. Mfg. Co.,

70-82 W. Jackson Boulevard, Chicago, U. S. A.

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CABINET TELEPHONES

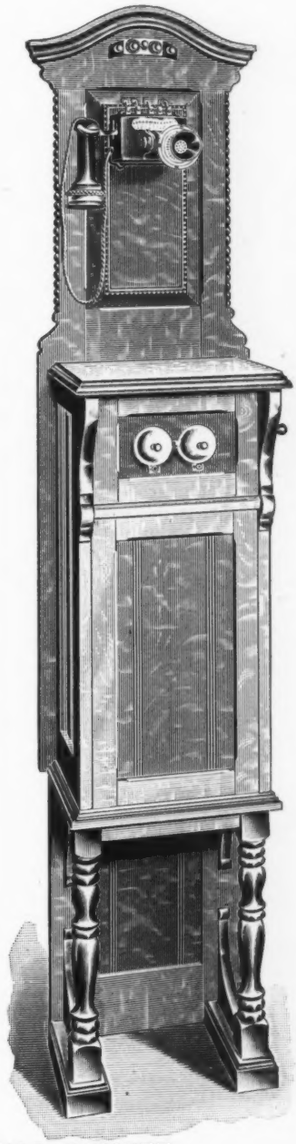
FOR

TOLL BOOTHS, FINE OFFICES AND RESIDENCES, ELEGANTLY DESIGNED, FINELY FINISHED.

CABINET DESK.

YOU are cordially invited to visit and make your headquarters in Sec. "G," Electricity Building, Pan-American Exposition, and inspect our exhibit of a full line of telephone equipment and working exchange. The "Central Energy" system is in service throughout the grounds and buildings for official use. It is the ONLY independent exchange giving telephone service at the exposition.

YOU SHOULD NOT FAIL TO VISIT SECTION "G."



WALL CABINET.

The Stromberg-Carlson Tel. Mfg. Co.,

70-82 W. Jackson Boulevard, Chicago, U. S. A.

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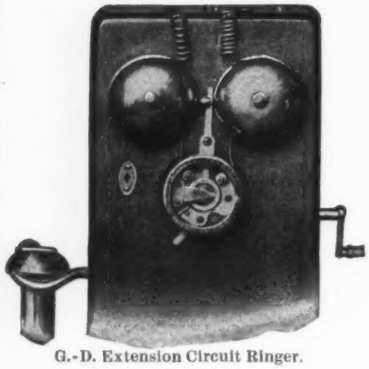
THE G.-D. EXTENSION CIRCUIT DEVICES

Made in two styles as shown herewith. The "Ringers" being automatic, requiring no resetting, and the "closers," being the same as the ordinary magnetic drop shutter devices, but cheaper. . . . . .



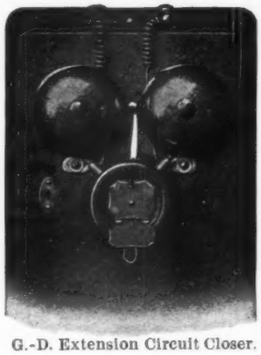
G.-D. Extension Circuit Ringer.

They are mounted on the front of a magneto, and the movement of the bell clapper actuates them, closing an extension battery circuit, ringing a bell at a distance.

The Ringers are in big demand for use on party lines, as they reproduce the exact signal of the magnets and require no resetting.

They will do your work to your satisfaction. Order a sample, as below, and if not O. K. we will return your money.

ASK FOR DESCRIPTIVE PAMPHLET No. T-30, AND PRICES.



G.-D. Extension Circuit Closer.

WE WILL SEND one sample Ringer as shown above, on receipt of $1.00 postpaid. Cash with order to secure price.

GARTON-DANIELS CO.,

KEOKUK, IOWA.

WE WILL SEND one sample Closer as shown above, on receipt of 50c. Cash with order to secure price.

THE TELEPHONE HAND-BOOK

NEW AND REVISED EDITION, WITH A NEW CHAPTER ON "RECENT PROGRESS," BRINGING THE BOOK UP TO DATE.

BY HERBERT LAWS WEBB.

160 Pages, 133 Illustrations, Cloth, Hand-Book Size . . . . . Price, $1.00.

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2. Sound Waves. Articulate Speech.
3. Electric Telephony. The Bell Telephone.
4. The Microphone.
5. Current Induction. Electromagnetic Induction.
6. The Induction Coil: Its Use in the Telephone Transmitter.
7. The Complete Telephone Circuit.
8. Magnet Telephones.
9. The Bell Telephone Receiver.
10. Other forms of Magnet Telephones.
11. The Gower, Ader and D'Arsonval Receivers, Mercadier's Bi-Telephone.
12. The Siemens, Kotyra, Neumayer and Böttcher Receivers.
13. Carbon Transmitters.
14. The Blake Transmitter.
15. The Long Distance Transmitter.
16. The Solid-Back Transmitter.
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20. The Efficiency of Carbon Transmitters.

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23. Closed Circuit Batteries.
24. The Practical Management of Batteries.
25. Magneto Bell.
26. Automatic Switches.
27. Telephone Line Construction.
28. Metallic Circuit.
29. Underground Wires.
30. Lightning Arresters.
31. Inside Wiring.
32. Installation of Telephone Instruments.
33. Inspection and Maintenance.
34. The Condenser; Its Use in Telephony.
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37. Small Exchanges.
38. Party Lines: The Bridging Bell.
39. Long Distance Telephony.
40. Duplex Telephony.
41. Simultaneous Telegraphy and Telephony.
42. Recent Progress. Appendix.

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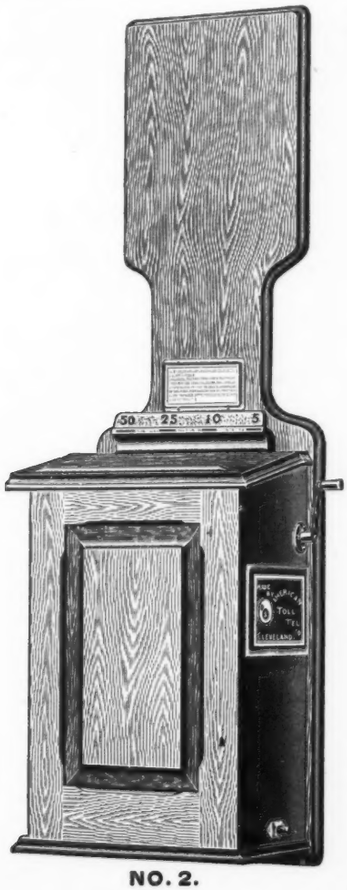
218 CENTRAL BATTERY TELEPHONE EXCHANGES EQUIPPED WITH "AMERICAN" STORAGE CELLS.

SEND FOR DESCRIPTIVE CIRCULAR AND PRICE LIST.

AMERICAN BATTERY COMPANY,
172-174 S. CLINTON ST.,
CHICAGO, ILL.
Established 1889.



NO. 2.

PENNIES OR WASHERS
ON A STRING

DO NOT OPERATE
OUR MACHINES.

We have machines for all kinds of service.

We are the leaders in Pay Stations.

NO. 6.

The American Toll Telephone Company,
43-45-47 Sheriff Street, CLEVELAND, OHIO.

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DESIGNERS AND MANUFACTURERS OF TELE

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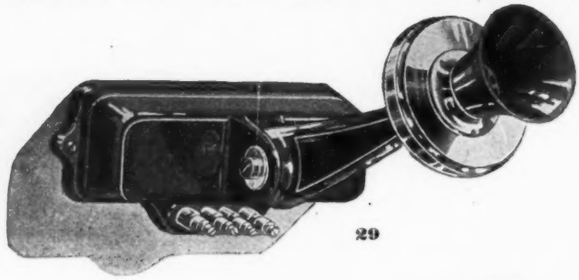

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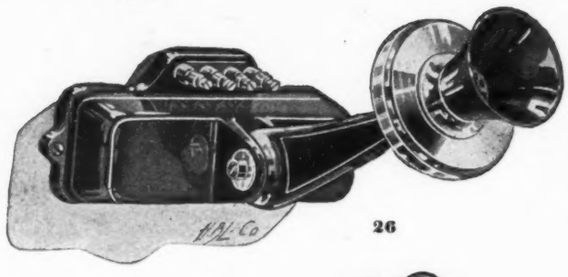

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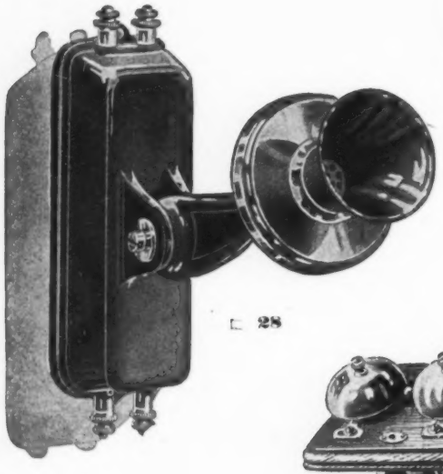

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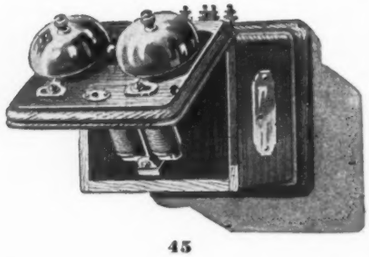

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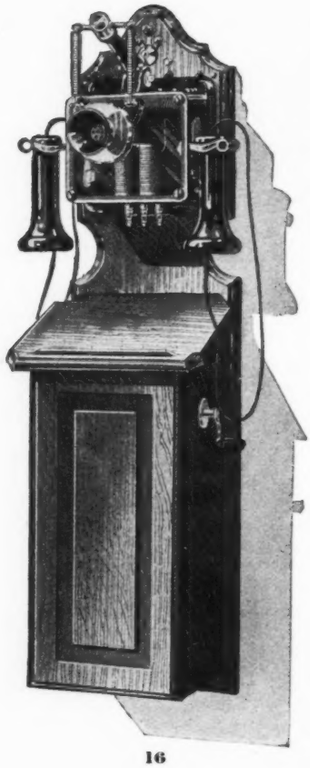

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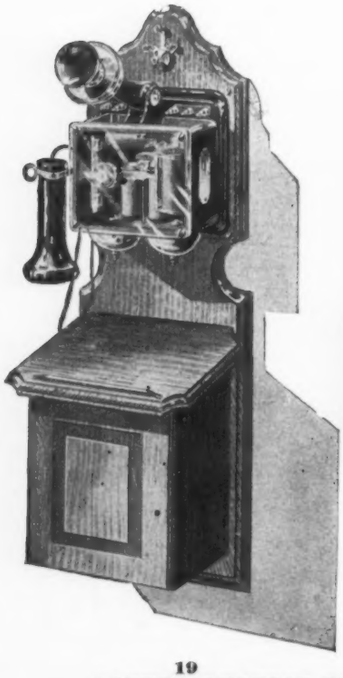

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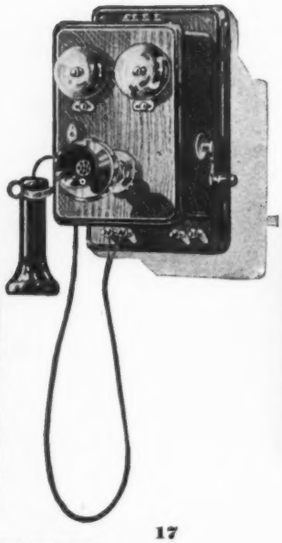

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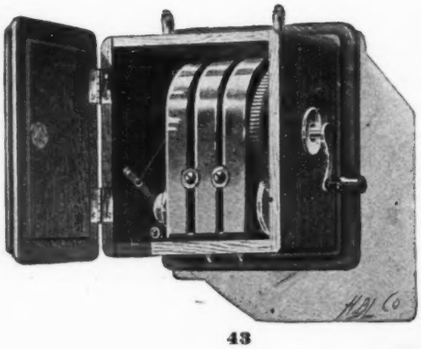

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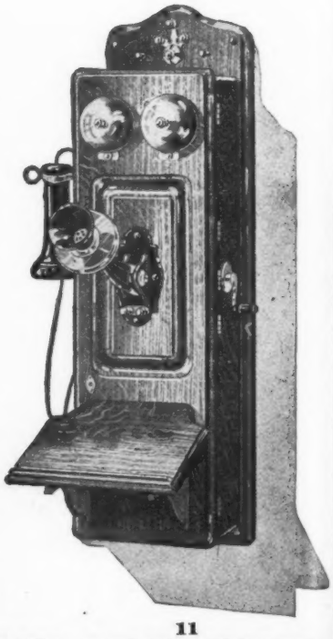

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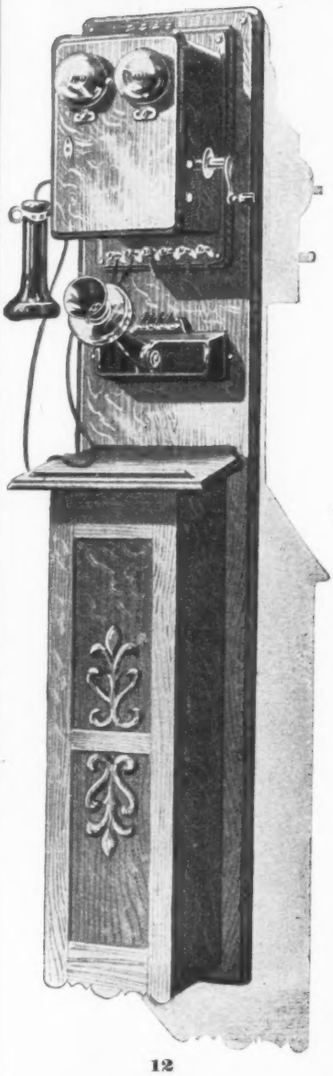

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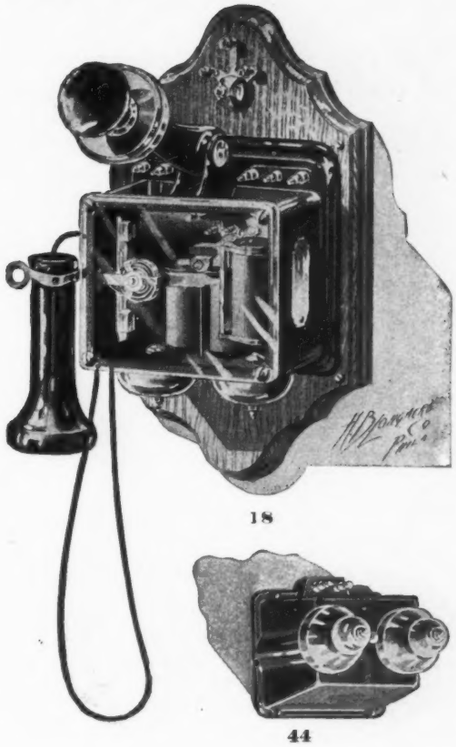

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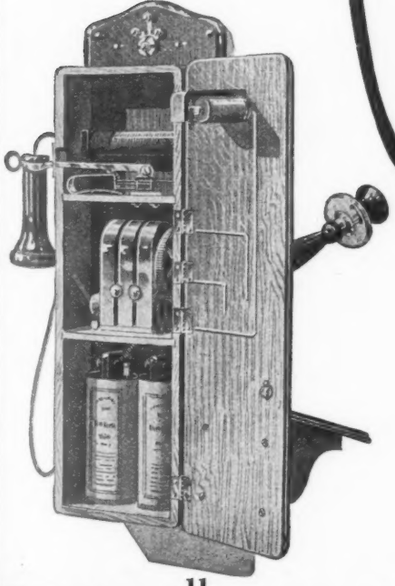

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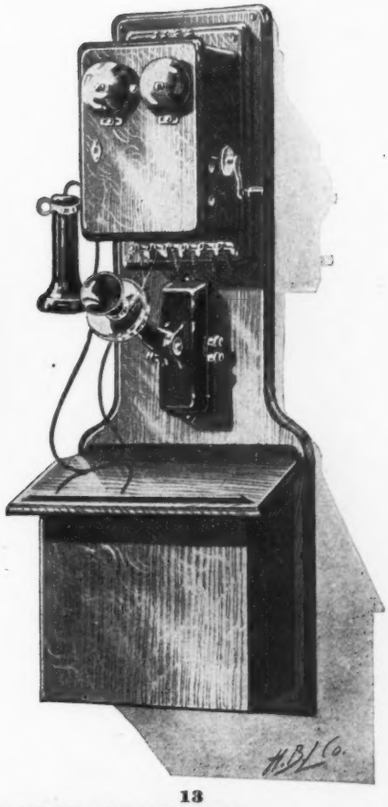

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PENNA., U. S. A.

FACTORIES: MEMPHIS AND TIOGA STREETS.
SALES OFFICES: 1205 STEPHEN GIRARD BUILDING.

Sun Electric Manufacturing Company,

GENERAL OFFICES:
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PHILADELPHIA, PA.,
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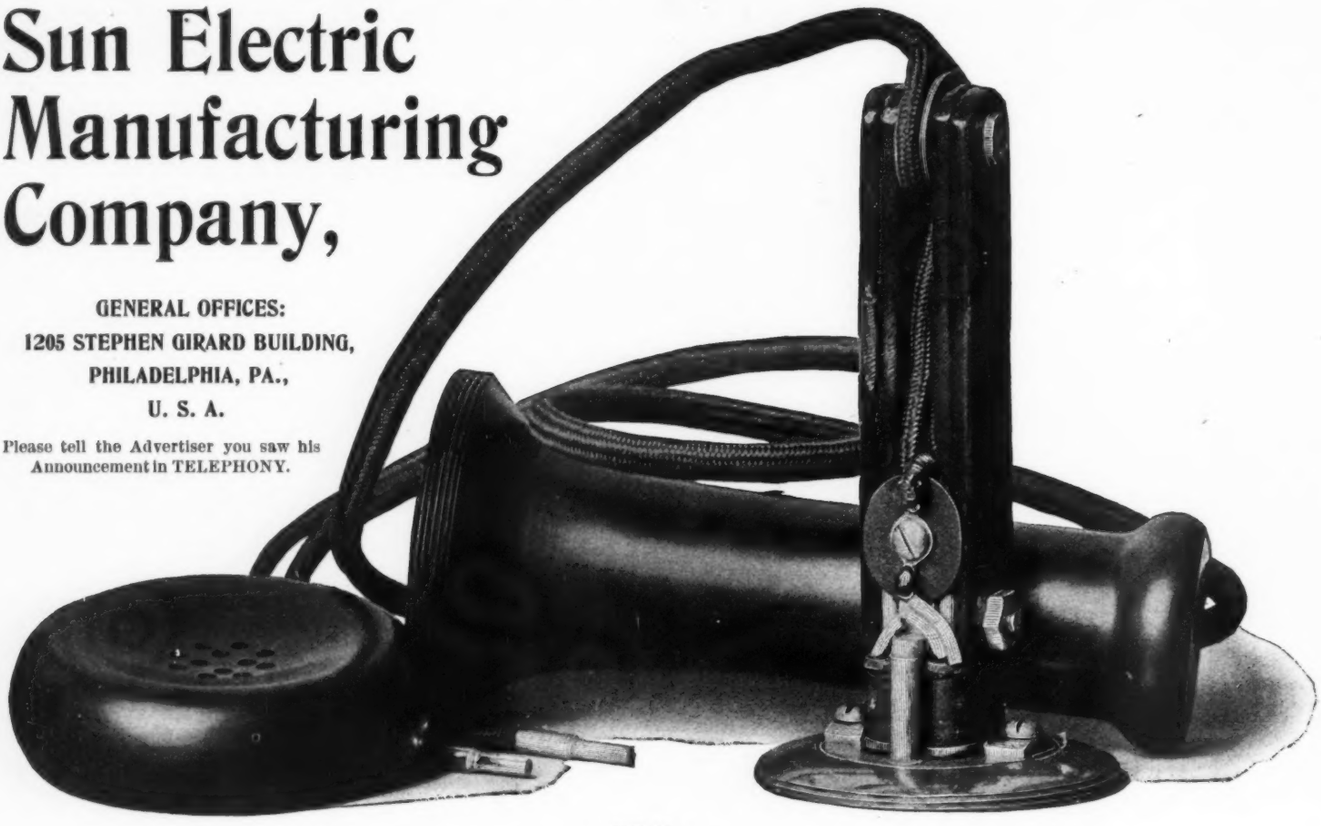

CUT NO. 2.

RECEIVER. Cuts Nos. 1 and 2. Our receiver is a new departure, like the transmitter. Examine it carefully. It has a genuine hard-rubber shell, of very desirable design, with a cap that is novel in that it contains a series of small perforations instead of the single large opening heretofore used by others. The magnet structure is made as a unit, assembled and adjusted without regard to the shell. The magnet steel is very efficient, specially made for us under a formula guaranteed to perfectly preserve its magnetism at full strength. The cord is secured to the magnet structure, and there are no external binding posts. The entire magnet structure is carried on a metal disc adjustable in a metal ring which carries the diaphragm, and the construction is mechanically and electrically perfect.

As for the talking qualities of these instruments, they are superior to others.

CUT NO 3.

CUT NO. 4.

TRIPLET SETS. Cuts Nos. 3 and 4 show Triplet Sets. The operative parts of the telephone proper are contained in what we call our Triplet box. We originated this box and have had it in use several years with satisfaction to ourselves and customers. It consists of a rectangular casting with open front, to which we fit either a plate-glass or cast-iron cover. The glass front box (Cut No. 3) enables a constant inspection to be had of all parts of instrument, which are nickel-plated and polished. In the iron front they are nickel-whitened, but are otherwise the same, Mounted in Triplet Sets are our Standard Switch Hook, Ringers, and Induction Coil. Mounted on the top of the box is a saddle having a cone-bearing hinge in which turns the transmitter arm This arm is hollow and the transmitter cords are therefore concealed. The pivot screws and fittings of the arm hinge are finely nickeled, as are all the fittings of our instruments.

American Telephone Practice

By KEMPSTER B. MILLER, M. E.

$3.00 518 large pages, profusely illustrated, with 379 diagrams and cuts of apparatus. **$3.00**

The London (England) Electrical Engineer says: "This is a book the like of which could not have been produced in this country."

No live telephone man can afford to be without it, as it is a perfect encyclopedia of useful information concerning telephony.

It gives complete specifications, enabling you to intelligently order apparatus or supplies from manufacturers or to properly supervise the installation of an exchange, large or small.

It describes in simple language the theory and practice of modern telephony, including the circuits, mechanical construction and operation of telephones and switchboards.

A complete description is given of storage batteries, their care and maintenance; of aerial and underground line construction, and, in fact, all the important matters which telephone men need to know.

The Telephone Book of the Century.

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OFFICES AND SALESROOMS:
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NEW FACTORY:
WINTHROP HARBOR, ILL.

"THE PIONEER"

INDEPENDENT TELEPHONE MANUFACTURING COMPANY OF THE UNITED STATES.

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ALL KINDS OF HIGH-GRADE, UP-TO-DATE TELEPHONE APPARATUS FURNISHED WITHOUT DELAY.

.....

MAKER OF THE BEST CENTRAL BATTERY APPARATUS ON THE MARKET. THE SMALLEST AND LARGEST SIZE EXCHANGES FULLY EQUIPPED.

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SATISFACTORY SERVICE GUARANTEED. ALSO GUARANTEE AGAINST INFRINGEMENT OF OTHER SYSTEMS.

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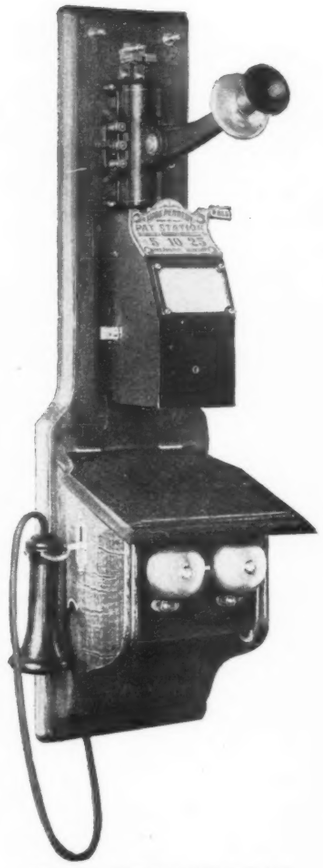
ORDERS FILLED PROMPTLY.



CENTRAL BATTERY PAY STATION TELEPHONE.

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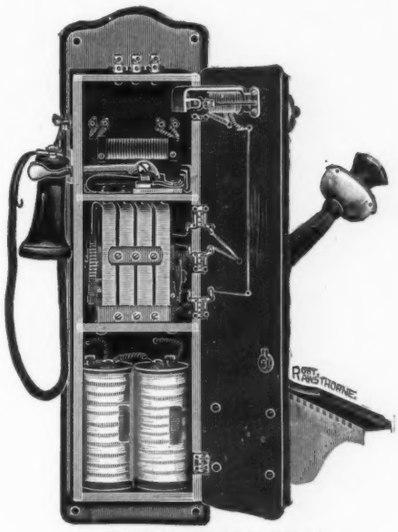
NEW CREATIONS BORN FROM EXPERIENCE, NOT MODIFIED EXPERIMENTS.

No. 80 LITTLE GEM.

Their entire conception is dictated by the demands of usage.

Their appearance as complete as a watch.

Order a sample; it will tell the whole story.



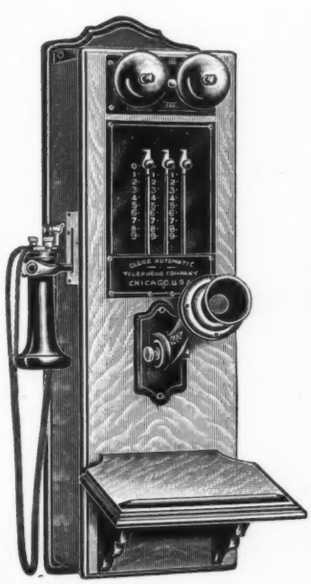
No. 80 LITTLE GEM.

HIPWELL MANUFACTURING CO.,

ALLEGHENY, PA.

GLOBE AUTOMATIC

TRADE MARK



This is Modern.
All others
Out of Date.

Never
Sleeps nor
Eats,
Needs No
Light,
No Heat,
No Salary,
Always on
Duty.
Our Prices
and Terms
are Right.

TRADE MARK

You are behind the times if you do not investigate into the merits of the Greatest Money Maker on Earth.

TRADE MARK

TRADE MARK

GLOBE AUTOMATIC TELEPHONE CO.

OFFICES: 59 Dearborn St. FACTORY: 31-45 W. Randolph St.

CHICAGO.

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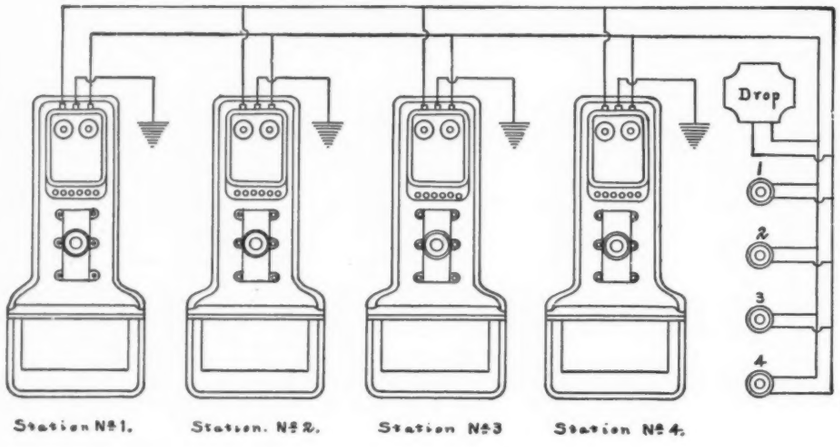
STERLING ELECTRIC COMPANY

PARTY LINE

Selective Signal



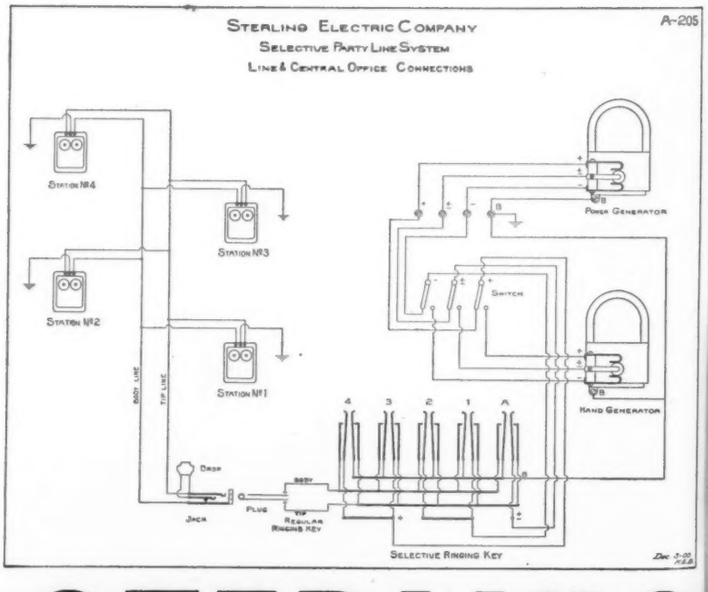
Do Not Infringe the Carty Patent.

SWITCHBOARDS.

Multiple,
Common Battery,
Battery Calling,
Generator Calling,

Lamp Signals,
Visual Signals,
Drop Signals,
Double Supervision,

In fact, Boards for All Services.



STERLING ELECTRIC COMPANY

FACTORY AND MAIN OFFICE:
Lafayette, Indiana.

STERLING

TELEPHONES

STERLING ELECTRIC COMPANY

Non-Interfering

Work Where Any Telephone Will Work.

WORK UPON ANY MAKE OF SWITCHBOARD.

NO QUESTION OF BALANCE OR ADJUSTMENT.

SHIPPED ON 30 DAYS' TRIAL.

GUARANTEED. TRY A SET.

PROTECTORS.

Cook's Complete, for Exchanges of Any Size.

Cable Terminals for all Uses, both the Outer and Inner Ends of Cables.

FUSE AND CARBON PROTECTORS.
CARBON TOLL LINE PROTECTORS.

Protectors of All Descriptions for Cables, Exchanges and Station Equipment.

ELECTRIC CO.

BRANCH OFFICE:
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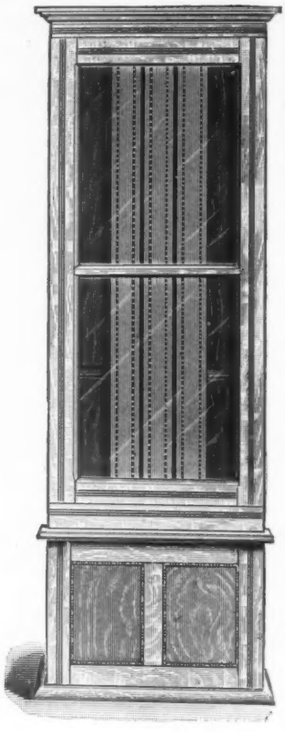

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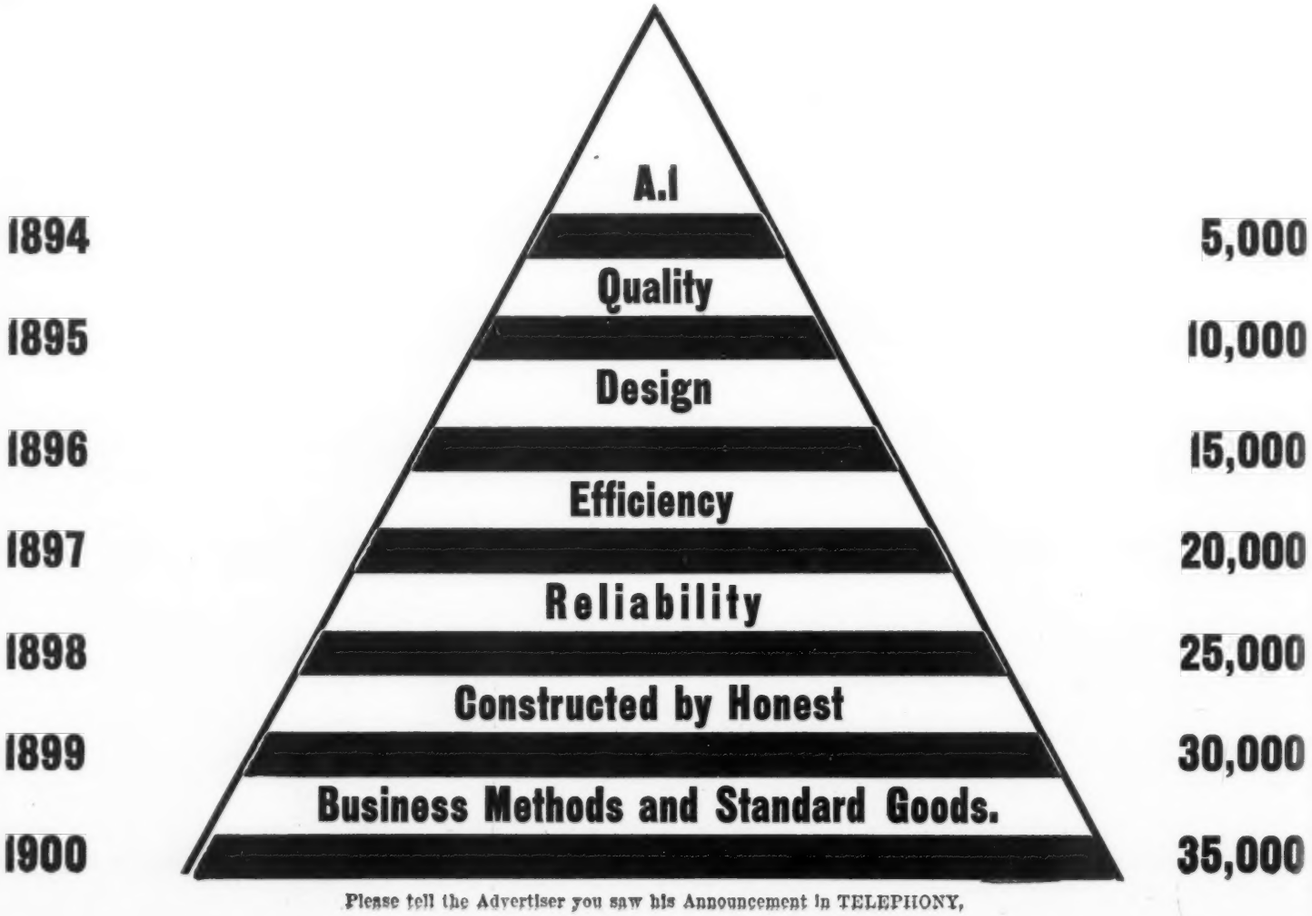

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Independent Telephone Association
of the
United States of America

Will be held at the Pan-American Exposition Grounds, in the city of Buffalo, N. Y., on June 11, 12 and 13, 1901. This will be the largest and most enthusiastic Independent Telephone Convention ever held, and every exchange and toll company should send at least one representative.

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If you go to the convention travel on

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OF

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IT will contain **many special features** and be the **largest** and **best** issue of a **Telephone Journal ever published. An unusually large edition** will be printed and copies will be sent to **Every Independent Telephone Exchange** in the **United States, Canada** and **Mexico** as well as to the leading **Toll Line Companies, Construction Companies, Superintendents of Telegraph, Manufacturers, Supply Houses, Individuals,** etc., etc. Also to telephone buyers in Foreign Countries. It will contain a complete report of the proceedings of the Fifth Annual Convention of the National Independent Telephone Association, to be held in Buffalo, June 11, 12 and 13. **Every Advertiser** in the **Telephone** or **Allied Industries** should take **liberal advertising space**. No such **opportunity** to place **your product** before the **telephone buyers** of the world has ever been offered. **Copy** and **cuts** should reach this office by not later than June 27, and earlier if possible, in order to get **prominent location**. No manufacturer can afford to miss being represented in the

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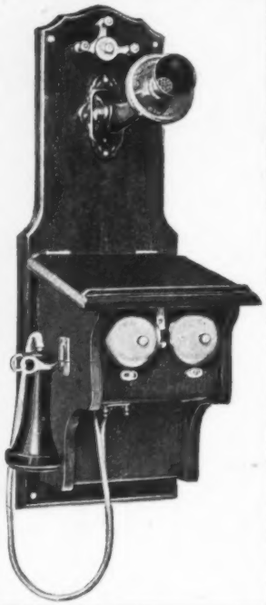

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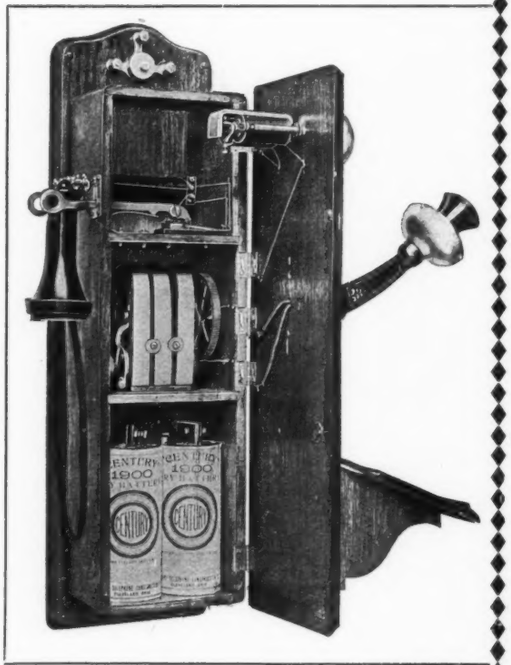

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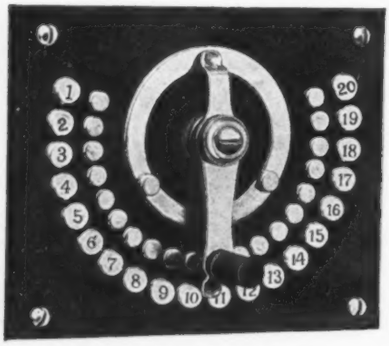

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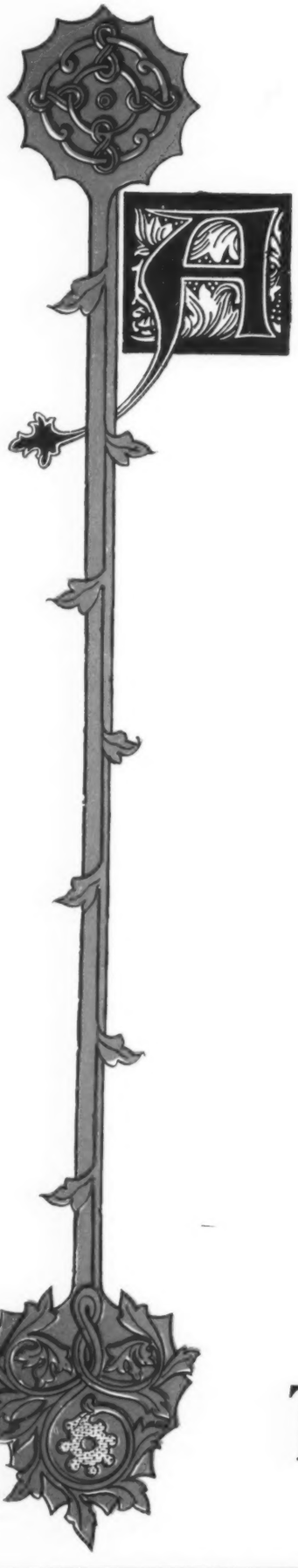
Folks who have not Northphones, lucky streak will lose;
We have a plan to help you proper course to choose.
A little "good luck" talisman, warranted of might,
It's yours just for the asking, we'll send it if you write.

THE NORTH ELECTRIC CO.



GREETING

to the *National Association:*

We desire to extend our congratulations and best wishes. At the same time we express our *regrets* that unfilled contracts render it impossible to make an exhibit without seriously discommoding our customers.

Join us in our "Good Luck" Greeting.

The NORTH ELECTRIC CO.

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Complete stock single and double cotton and silk insulated magnet wire, reinforced telephone switchboard cords, silk desk set cords, special tinsel cable cord, induction coils, single pole receivers.

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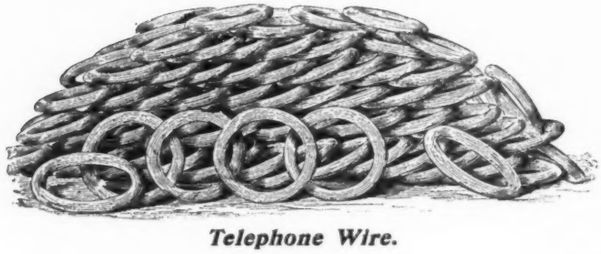

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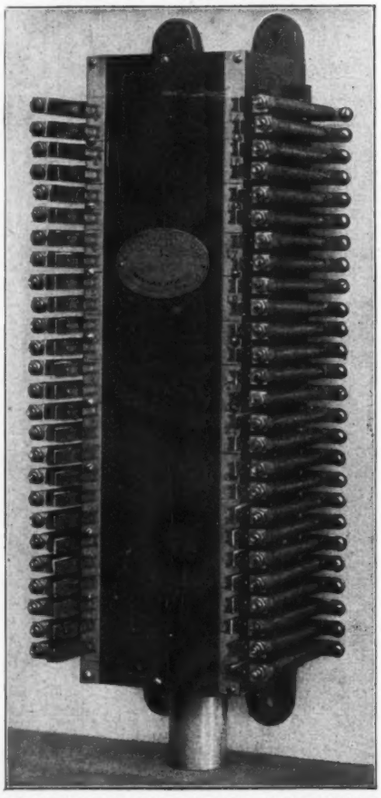

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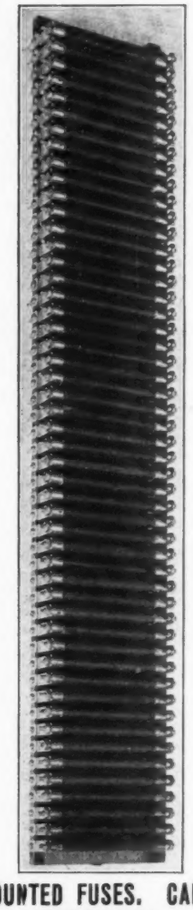

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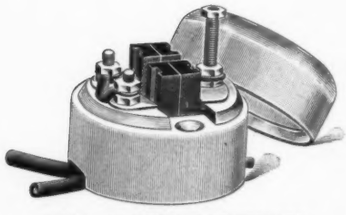

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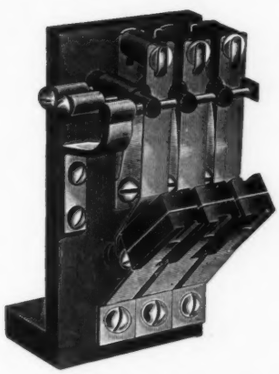

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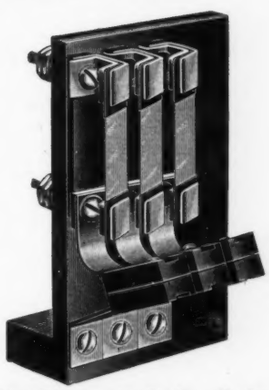

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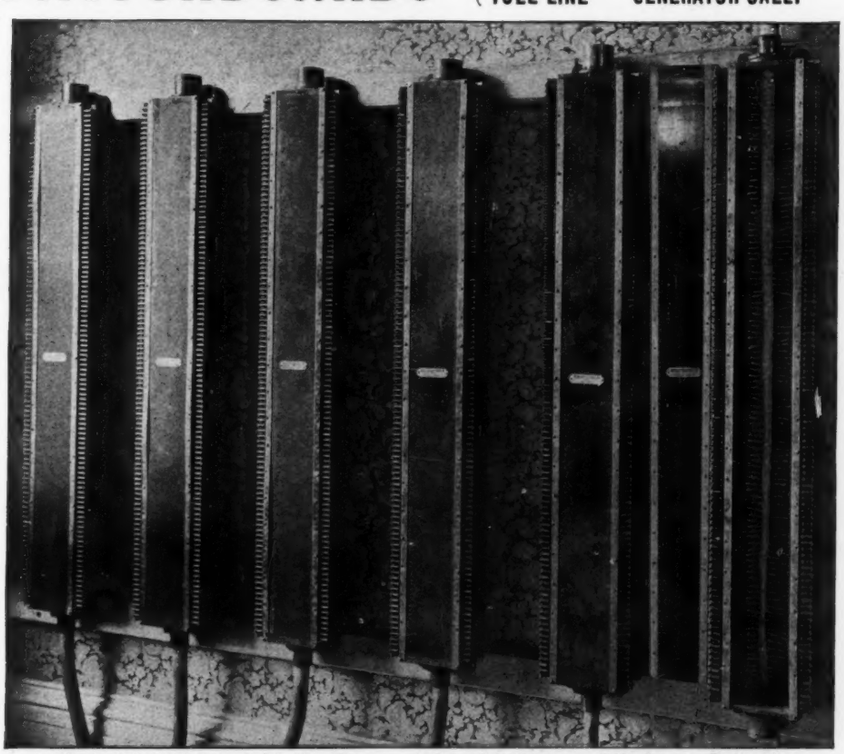

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Model 25

Write us regarding our guarantee, and proposition on sample orders.

Illinois Telephone, Model 25, is guaranteed to ring as large a number of bells connected in multiple as any telephone on the market.

Illinois Telephone, Model 25, is guaranteed to give satisfaction on any line under any conditions where any other bridging instrument will work.

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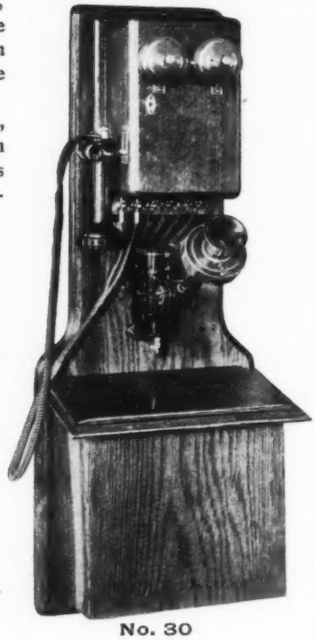
Laminated armature.
Ten-bar generator.
Sensitive ringer.
Laminated magnets.
Improv-d bell type transmitter.
Adjustable arm with concealed or open cord.
Long-lever switch.
Long-distance coil.
Bipolar receiver.
Two-cell battery box.
Best construc ion

Illinois Long Distance Exchange Telephone



No. 30

Finished in polished oak or walnut; equipped with strong magneto generator 10,000 ohms, nickel-plated or cardinal enamel finish, double-pole hard rubber pony receiver and cord, solid back transmitter, long-lever automatic hook, adjustable transmitter arm, 400-ohm induction coil, and backboard with battery box for two wet cells.

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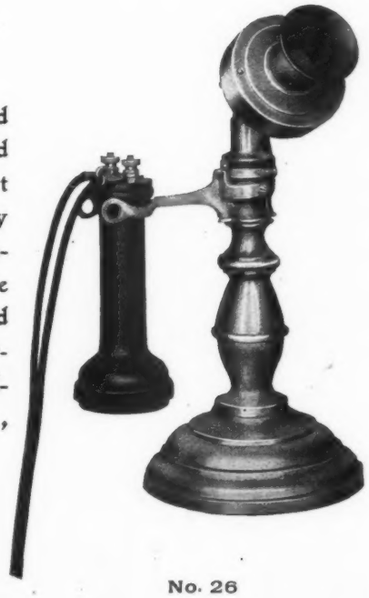

No. 26

ILLINOIS ELECTRIC COMPANY,

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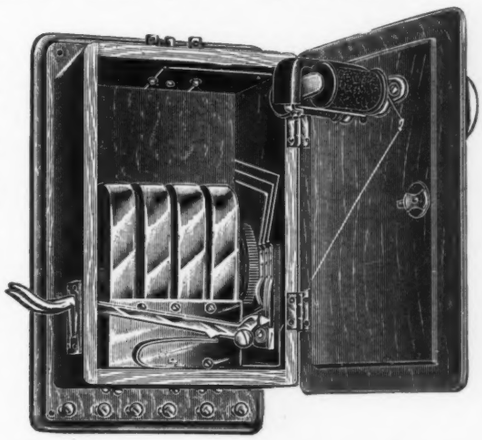
We Manufacture Magneto Bells—and other apparatus. It may be to your advantage to hear our argument — and get our prices.

The Magnetos manufactured by this company have heavy cut cog gears, automatic shunt, and are fully guaranteed. Nothing but the best of material enters into their construction, the steel being manufactured expressly for us. The switch and ringer movement are our standard patterns and we wind the latter to any desired resistance. The Magneto box is of highly finished quartered oak.



WE WILL THANK YOU FOR YOUR CORRESPONDENCE.

Advance Electric and Telephone Co.,

ELECTRICAL BUILDING, CHICAGO, ILL.

YELLOW PINE CROSS ARMS

We are manufacturing cross arms from the high grade long leaf yellow pine of central Mississippi and our shipping facilities are the best in the state. You will find both prices and goods right. Write us.

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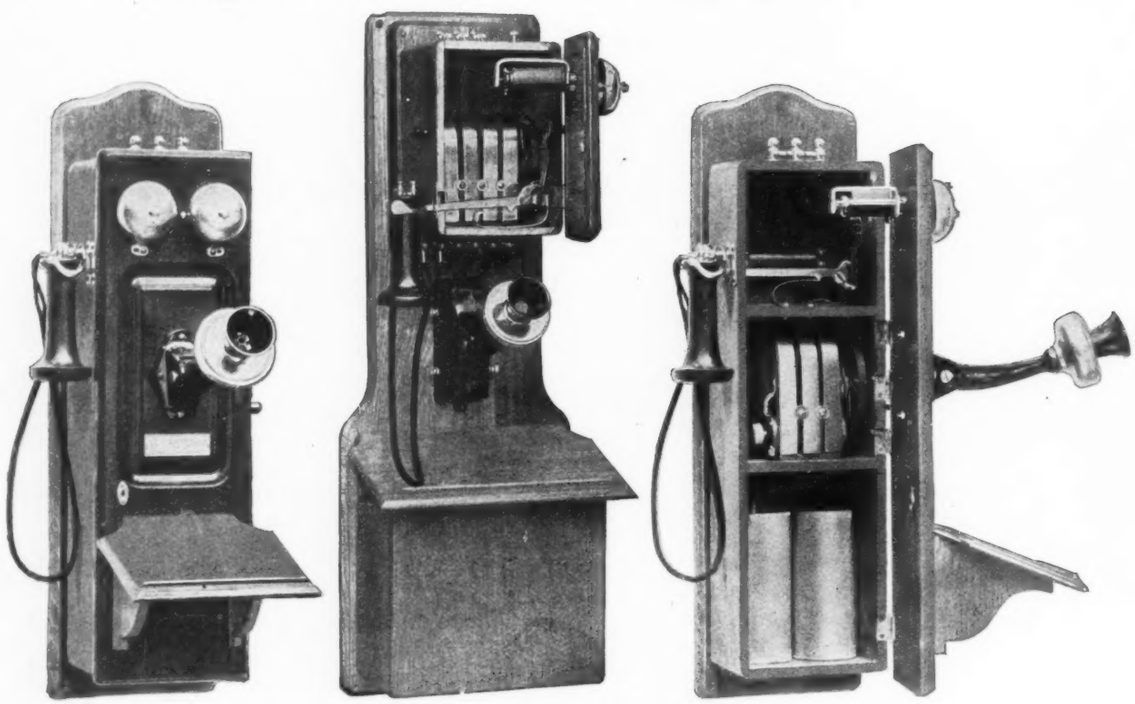
St. Louis Electrical Supply Co.

ST. LOUIS, MO.

MANUFACTURERS OF HIGH-GRADE

Telephone Apparatus



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From Ceiling or
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...Makers of...

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Prices right on everything in telephones.

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SIMPLY LOWER
THE HAND
PHONE

POSITIVELY
THE NEATEST,
Simplest and Most
Convenient
Telephone Made

Please tell the Advertiser you saw his Announcement in TELEPHONY.

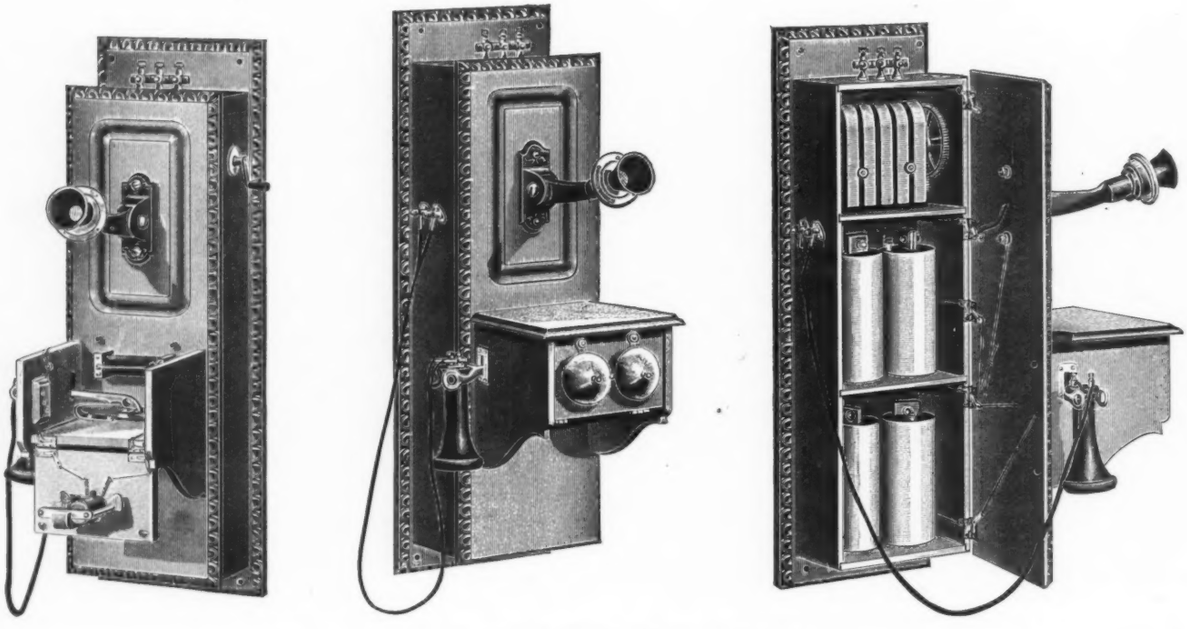
L. SANDS, President. J. M. GRUNDY, Secy & Treas. H. C. DODGE, General Manager.

THE

WILLIAMS-ABBOTT ELECTRIC COMPANY,

CLEVELAND, OHIO, U. S. A.

Something New in Telephones.



THE EUCLID TELEPHONE

The accompanying cuts show the absolute perfection of details of construction of this instrument—**A Full Jeweled Triumph**; will be technically considered by the most critical, a perfect combination. Dimensions of the backboard are 9 inches in width by 27 inches in length. The cabinet contains up to four cells of dry or two cells of wet battery. The instrument is specially designed for use in connection with heavily loaded toll and party lines, either series or bridged and is equipped as called for, with our Boston four magnet or five magnet generator. This is destined to be by far the most popular toll line telephone ever made.

UP-TO-DATE IN EVERY RESPECT. EMPLOYING CARBON LIGHTNING ARRESTERS AND LOCKNUT BINDING POSTS.

WRITE FOR ILLUSTRATED CATALOGUE "A."

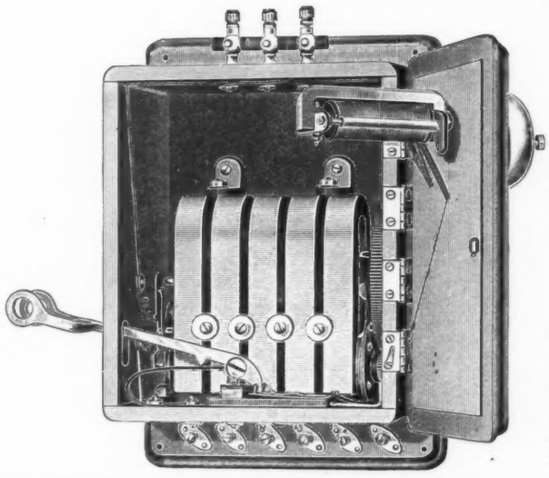
Please tell the Advertiser you saw his Announcement in TELEPHONY.

"SANDS VICTOR" TELEPHONE,

Which is made both for series and multiple work, is a radical departure from old models. This instrument is designed to meet a long-felt want for a handsome, compact wall set, perfect in all its details, with parts so arranged that the utmost ease of access is afforded for their inspection, adjustment and repair.

THE WILLIAMS-ABBOTT UNIVERSAL RECEIVER.

The best pattern and most approved construction; adjustment absolutely perfect and permanent; not affected by change of temperature or rough handling; can be taken apart and then assembled with the greatest ease and accuracy; combines efficiency, stability and strength together with handsome appearance. With it cords with the ordinary tips are used. A heavy hard rubber shell is employed, with no exposed metal parts. This is the most popular receiver of the times.



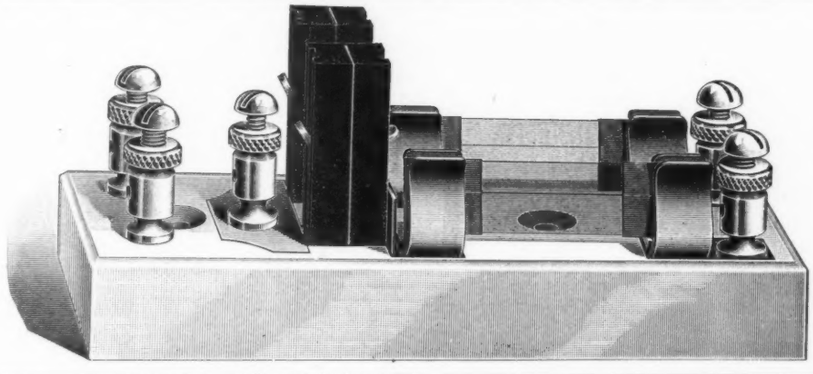
WILLIAMS-ABBOTT "BOSTON" 5-MAGNET BELL.

This is the Most Efficient, Durable and Handsome Magneto Bell on Earth and a Trial will Prove the Assertion.

We furnish "Boston" Magneto Bells with four or five magnet generators, wound for both series and bridged work, and equipped with either alternating or direct current generators.

Some of the Features of our Boston Bells.

Generator armatures are laminated, gears have wide face and are perfectly cut; pinions are flexibly attached to the shaft in a manner which provides for a steady movement of the armature; the bearings are heavy, cast pole pieces are employed, air-gap is small, shunt and cutout are perfect, nickle-plated magnets are used.



THE H. C. D. COMBINED CARBON AND FUSE ARRESTER

Improved, remodeled, employing locknut binding posts, improved fuse clips and carbon holders. Built upon lines practically and theoretically correct. A trial means its adoption.

The Williams-Abbott Electric Company,

The Largest Manufacturers of Magneto Bells for the Independent Trade in the United States.

WRITE FOR ILLUSTRATED CATALOGUE "A."

Columbia Telephone Mfg. Co.,

MANUFACTURERS OF

COMPLETE LINE OF IMPROVED TELEPHONE EQUIPMENT

To Meet All Requirements.

Prospective Purchasers are respectfully invited to investigate the merits of Columbia Telephones and Appliances.

This Transmitter is an Innovation. It embraces distinctive points of merit. The construction is simple and such as to insure permanency. All factors of unreliability are eliminated, the carbon receptacle being made of glass. The diaphragm is kept under stress or tension by adjustable springs.

Columbia Transmitter.

It is an improved "solid back and is absolutely free from side tones."

Positively will not pack. Heat does not affect it and it is impervious to moisture. It is interchangeable, powerful, sensitive and in fact

PERFECT.

Columbia Telephones Combine Constant and Efficient Service with Longevity.

COLUMBIA TELEPHONE MANUFACTURING CO.,

194-204 SOUTH CLINTON STREET,

WRITE FOR DESCRIPTIVE MATTER AND PRICES.

CHICAGO, ILL., U. S. A.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Columbia Telephone Mfg. Co.,

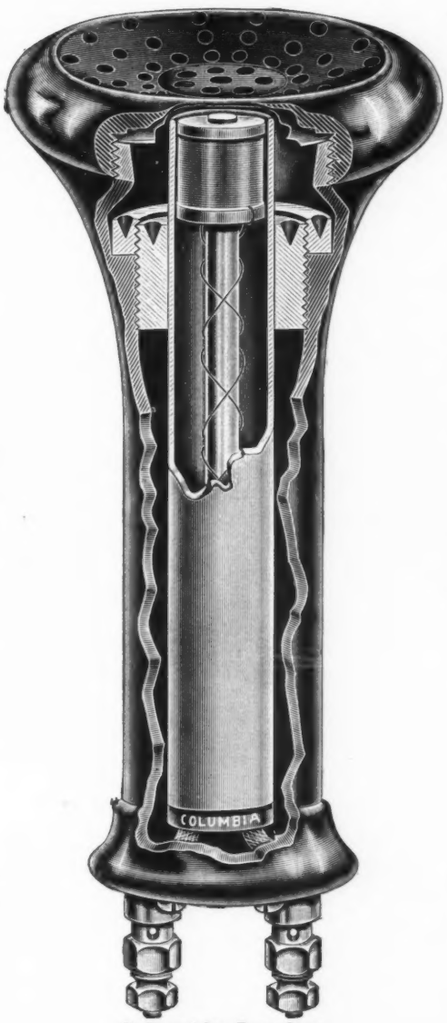
MANUFACTURERS OF

MULTIPLE EXCHANGES AND TOLL LINE SWITCHBOARDS.

Prospective Purchasers are cordially invited to correspond with us regarding their requirements.

This Receiver is built on entirely new and improved lines, meeting the requirements of most exacting service. The entire mechanism is enclosed in tubular magnet making it self-contained and insuring perfect adjustment. Solid Rubber, Bell Flare Shell, furnished with exposed connection or concealed cord. Perforated cap, insures increased clearness, resonance and voice power. This is a Double Pole Receiver and like the Columbia Transmitter is without doubt

PERFECT.



Columbia Receiver.

Columbia Telephones Reduce Cost of Maintenance, Repairs and Renewals to a Minimum.

COLUMBIA TELEPHONE MANUFACTURING CO.,

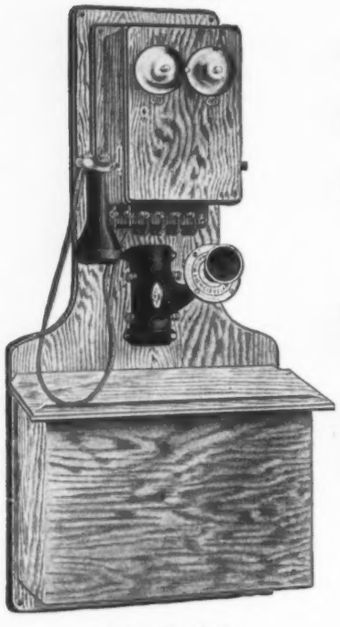
194-204 SOUTH CLINTON STREET,

CHICAGO, ILL., U. S. A.

WRITE FOR DESCRIPTIVE MATTER AND PRICES.

ECONOMY AND EFFICIENCY

Set No. 25.



"Our Best."

Are the most important factors in the Construction and Operation of a Telephone Exchange.

The Williams Magnetos, Transmitters AND Telephones

ARE THE STANDARD OF EXCELLENCE AND CORRECTLY PRICED.

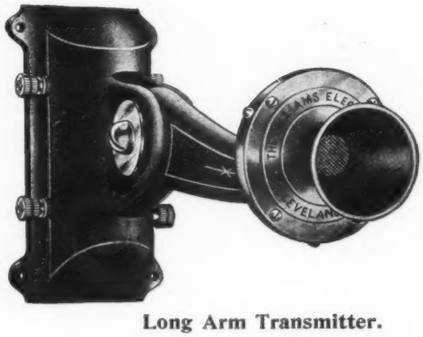
Set No. 35.

Long Backboard and Tandem Double Battery Box.

Series Magneto Bell.

PERFECT PHONES PRODUCE PROFITS.

OUR VIOLET G. T. & T. C. FOR THE ASKING. BE SURE AND ASK.....



Long Arm Transmitter.

The Williams Electric Company,

80-86 Seneca Street, = = = CLEVELAND, OHIO.

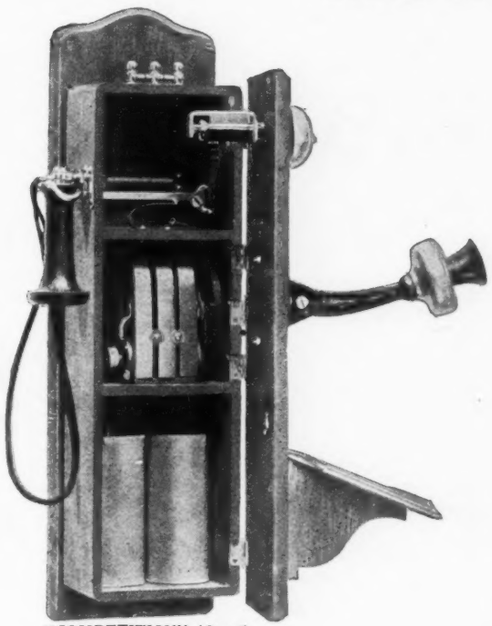
Write for New Illustrated Price List.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

WRITE US WRITE US

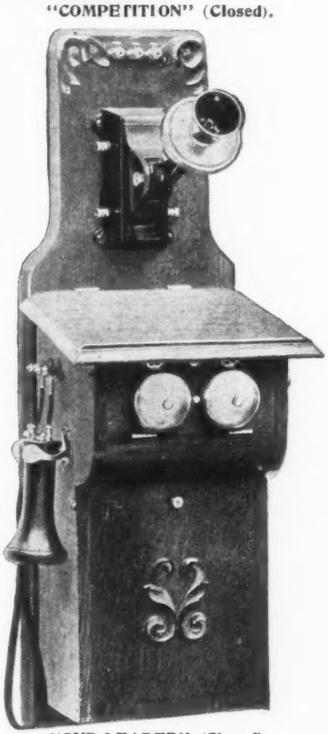
TELEPHONE APPARATUS, SUPPLIES AND ACCESSORIES

"COMPETITION" (Closed).



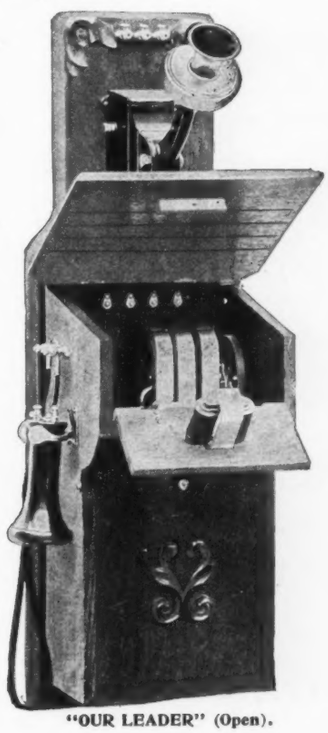
"COMPETITION" (Open).

LATEST TYPES AND MOST IMPROVED TELEPHONE APPARATUS ON THE MARKET. BEST QUALITY IN EVERYTHING.



"OUR LEADER" (Closed).

No. 1 DESK TELEPHONE.



"OUR LEADER" (Open).

CONSTRUCTION MATERIAL

CENTRAL TELEPHONE AND ELECTRIC CO.

909 Market Street, ST. LOUIS, MO.

WRITE US WRITE US

Please tell the Advertiser you saw his Announcement in TELEPHONY.

WHEN you write to the advertiser will you be kind enough to tell him that you saw his advertisement in TELEPHONY. He will appreciate it and so will we.

Independent Telephone Construction Co.

TELEPHONE ENGINEERS AND CONTRACTORS.

WE BUILD EXCHANGES COMPLETE,

LARGE OR SMALL, FURNISHING ANY MAKE OF APPARATUS DESIRED.

PLANS and SPEIFICATIONS FURNISHED for ANY KIND of TELEPHONE CONSTRUCTION.

WE BUY FRANCHISES, PROMOTE AND FINANCE TELEPHONE COMPANIES.

IF YOU ARE IN NEED OF TELEPHONE APPARATUS OR SUPPLIES OF ANY KIND WRITE US FOR QUOTATIONS.

INDEPENDENT TELEPHONE CONSTRUCTION CO.

CHEMICAL BANK BUILDING,
CHICAGO.

H. H. DAVENPORT,
Secretary and General Manager.

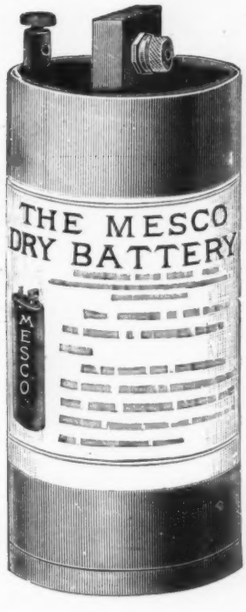
WE HAVE 10,000 CHESTNUT POLES FOR IMMEDIATE DELIVERY.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

MANHATTAN ELECTRICAL SUPPLY CO.

32 Cortlandt Street, NEW YORK. 186-188 Fifth Avenue, CHICAGO.

MESCO DRY BATTERY



Has furnished current for more transmitters than all other dry batteries combined. Their efficiency is unequaled, and now is the time to test them.

WHY?

Competition from makers of inferior batteries is discouraging the use of dry cells. The quality of the Mesco will be maintained no matter at what price it is sold.

Price at which the Mesco is furnished to telephone companies in quantities is less than actual cost to manufacture to us unless we have an output of 5,000 per day, which is about the present production.

GET OUR PRICE F. O. B. CHICAGO OR NEW YORK.

MANHATTAN ELECTRICAL SUPPLY CO.,

32 Cortlandt St., NEW YORK. 186-188 Fifth Avenue, CHICAGO.

460-PAGE CATALOGUE NOW READY.

INTERN

SPECIALTY

1005 MONADNOCK BLK.,

TELEP

CHEAP A

SUITABLE FOR PRIVATE LINES, HOTELS, ETC.

THIS IS A BARGAIN.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

ATIONAL

COMPANY

CHICAGO, ILLINOIS.

HONES

S DIRT!

EVERY PHONE GUARANTEED FOR FIVE YEARS.

ON SALE, JUNE 15th, 1901.

Electrical Conundrums.

Here are a few problems which we have solved:

Why does the Alden Electric Co. remind you of Yellowstone Park?

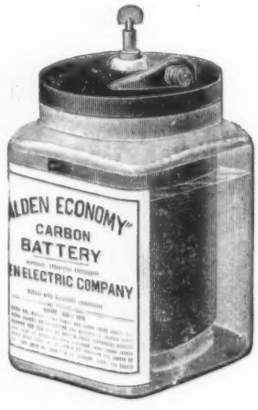
Why do "Plants" and dealers keep on buying of houses who do not recognize the importance of quick delivery?

We have devoted time to many problems in this business in order that we might save time and trouble to customers who *value* time. In addition we sell on close margins. These little things, added to the reliability of our goods, are details which our customers appreciate. So it is not

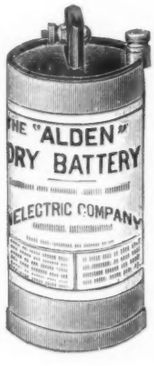
Hard To Guess

Why buyers turn to us. Our new catalogue of up-to-date electrical supplies will be sent free to responsible parties on application.

WE CARRY IN STOCK A COMPLETE LINE OF TELEPHONE SUPPLIES.



Cross-Arms, Insulators,
Pins and Brackets,
Carbon and Dry Batteries,
Construction and Line
Tools.



A full line of TELEPHONE WIRE, RUBBER COVERED PLAIN, RUBBER COVERED BRAIDED, SINGLE AND DOUBLE CONDUCTORS, and the INDEX BRAND WEATHERPROOF WIRE.

Direct Current FAN MOTORS Alternating Current.

ALDEN ELECTRIC COMPANY,

52-54 W. VAN BUREN ST., CHICAGO.

TELEPHONY'S

SPECIAL
TELEPHONE TRAIN

Composed of PULLMAN SLEEPERS with DINING CAR and BUFFET, LIBRARY and SMOKING CAR

Will Leave Chicago

Monday, June 10, 1901 6 P. M.

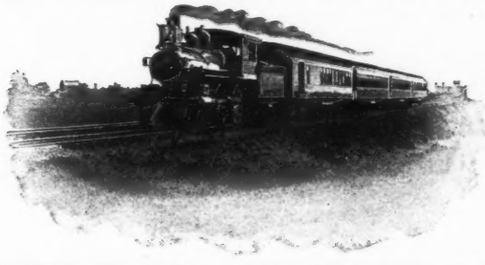
OVER

THE LAKE SHORE and MICHIGAN SOUTHERN RY.

To carry telephone men to the Fifth Annual Convention of the Independent Telephone Association of the United States,

To be held at BUFFALO, June 11, 12, 13, 1901.

A Special Car has been provided for the ladies.



The train will stop at Elkhart and Toledo for the Indiana and Ohio contingent.

SCHEDULE OF SPECIAL TRAIN.

Leave Chicago 6 P. M. - Elkhart, 8.45 P. M. - Toledo, 11.50 P. M.
Arriving BUFFALO, 7.20 A. M.

Round Trip from Chicago, $14.50. Tickets Good for 10 Days.
Tickets good on Boat from Buffalo to Cleveland returning.

Those coming from West of Chicago should purchase tickets over the **Lake Shore and Michigan Southern Railway** and advise the undersigned for reservations.

The leading Telephone Manufacturers, Supply Houses, Pole Dealers, Exchange Men of the West have made reservation.

As a matter of pride they are going to the convention on this special to show that nothing is too good for the West.

For Sleeping Car reservations telephone, telegraph, call or write to

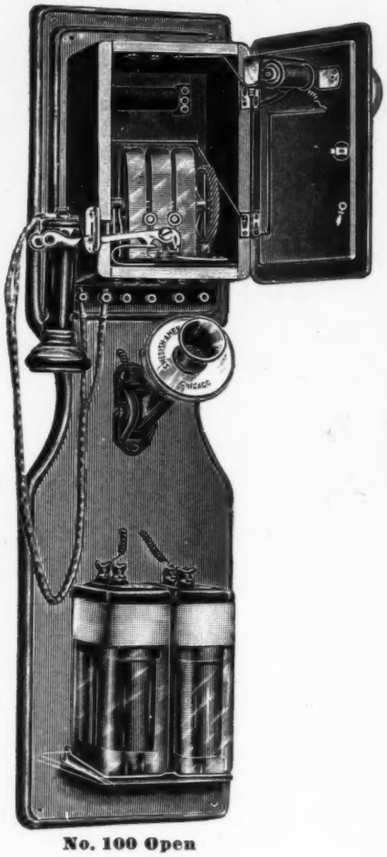
TELEPHONY, Manhattan Building, Telephone, Harrison 2951. CHICAGO.

or

L. S. VOSBURGH, C. P. & T. A., 180 Clark Street, Telephone Central 2683 CHICAGO.

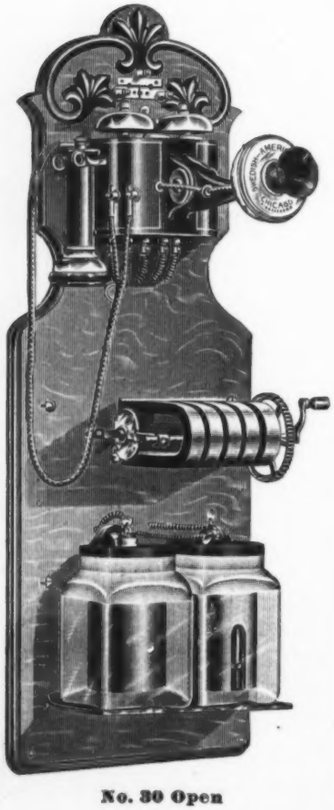
No. 31

No. 100 Closed



No. 100 Open

No. 34

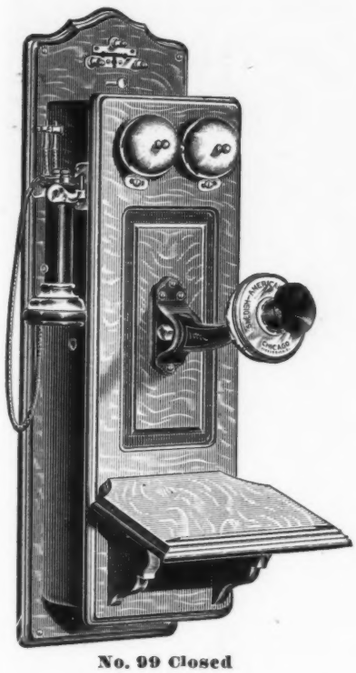


No. 30 Open

SWEDISH-
AMERICAN
TELEPHONE
COMPANY,
CHICAGO,
U. S. A.

No. 30 Closed.

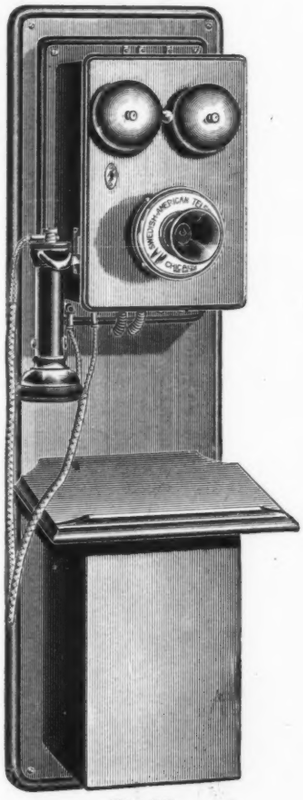
Please tell the Advertiser you saw his Announcement in TELEPHONY.



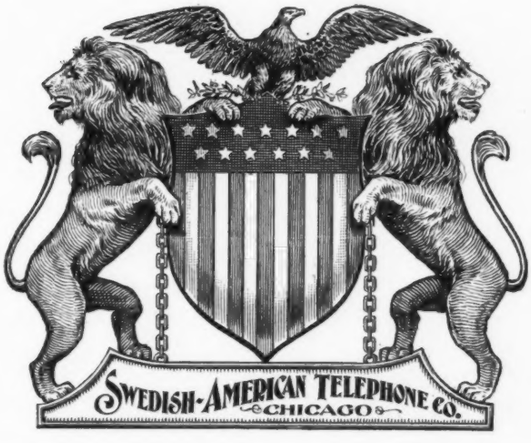
No. 99 Closed

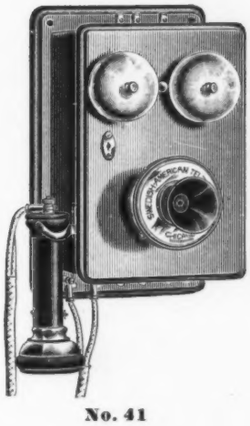
No. 99 Open

No. 50



No. 32

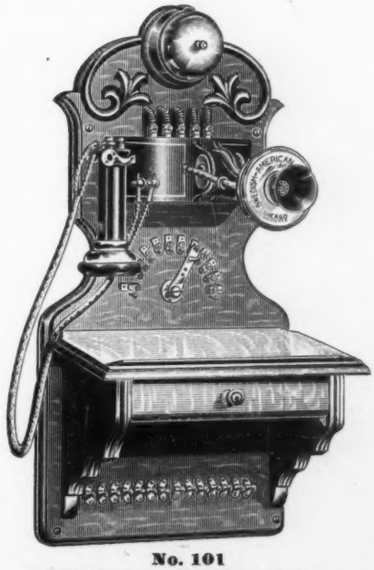




No. 41

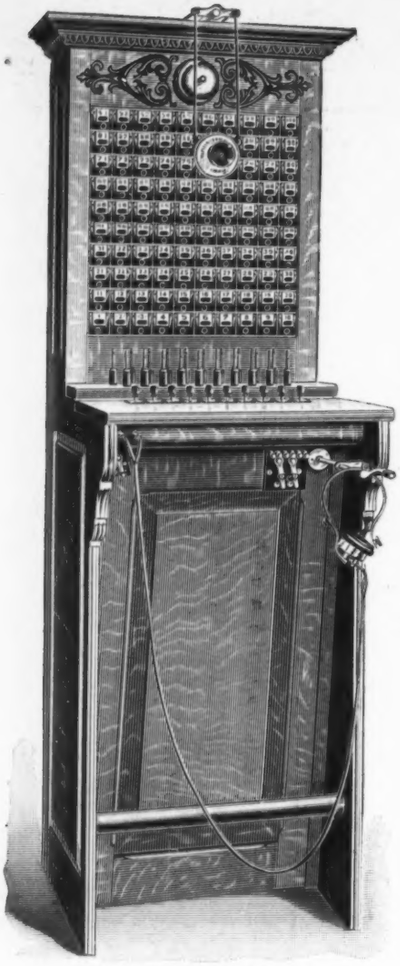
SWEDISH-AMERICAN TELEPHONE COMPANY,

CHICAGO, U. S. A.



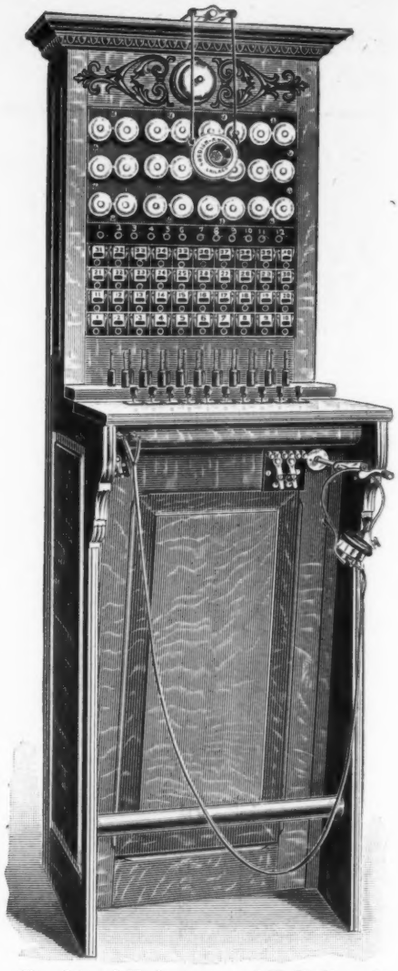
No. 101
Intercommunicating System

Please tell the Advertiser you saw his Announcement in TELEPHONY.

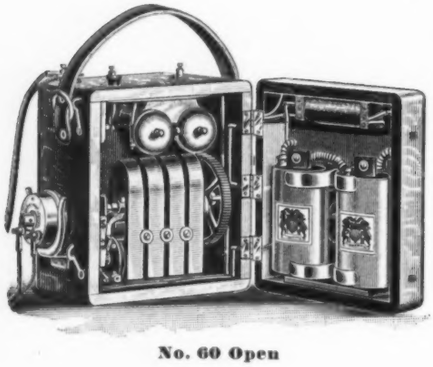


100-Drop Switchboard

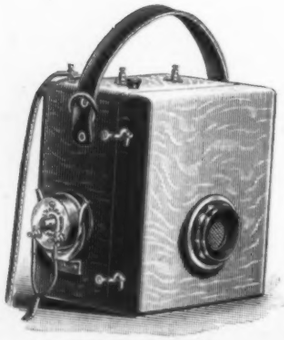
Telephone and Toll Board



Combined Exhange and Toll Board

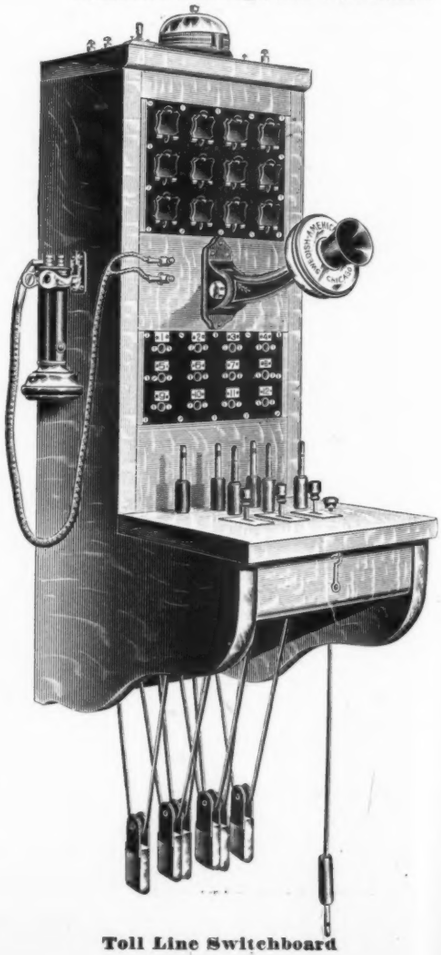


No. 60 Open



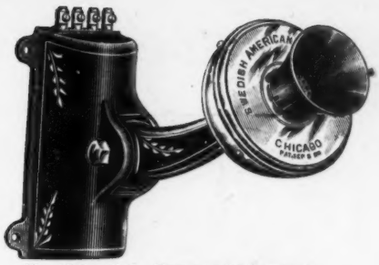
No. 60 Closed

Swedish-
American
Telephone
Company,
Chicago,
U. S. A.

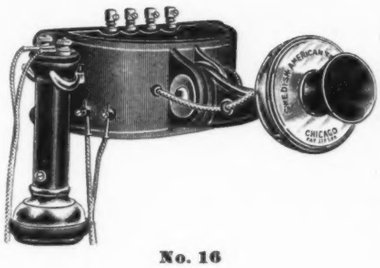


Toll Line Switchboard

No. 28

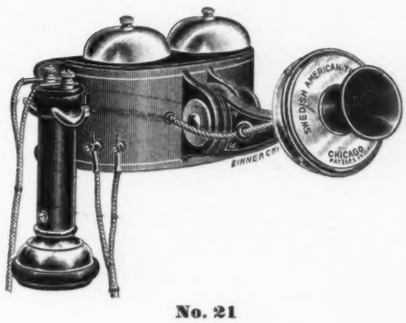


No. 27 with Concealed Cord



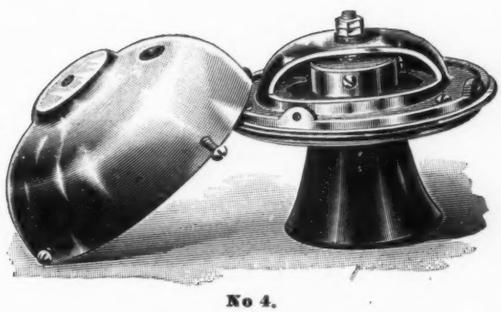
No. 16

No. 8

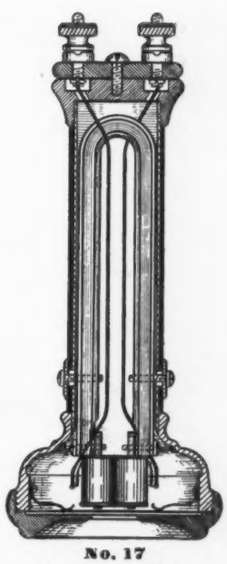


No. 21

No. 17



No 4.



No. 17
Sectional View

SWEDISH-AMERICAN TELEPHONE COMPANY,

CHICAGO,
U. S. A.

Swedish-American Transmitters are Exquisite in Expression, Durable in Construction, Reasonable in Price.

Copeland Cable Clip.

These hangers are made entirely of one piece of inoxidizable metal, therefore there are no loose parts to become separa ed or set up electrolytic action. The upper part forming the hook has a ridge pressed into it to give rigidity. The top sides are flanged outward to allow the hanger to ride easily a ong the suspension wire. Several spans of cable may be drawn at a time, thus saving labor at the different supports. The hangers are quickly applied as will be seen by the illustrations. They will ride easily on suspension wires up to half inch in diameter. When ordering please state for what diameter telephone cable.

Cat. No. **1582.** Copeland Cable Clips or Hangers....Each, **$0.03**

Cut approximate full size. Cat. No. 5180.

Improved Expanding Sleeves

For use with H-P Insulated Bridle Rings, when applied to brick, stone or iron work.

The Bridle Rings screw directly into these shields, which expand at the inner end and hold the Rings rigidly in position.

Cat. No. **5180.** Improved Ex'p'a n d i n g Sleeves for H-P Insulated Bridle Rings, Styles A, B, C and D. Each.....**$0.06**

Cat. No. **5380.** Improved Expanding Sleeves for H-P Insulated Bridle Rings, Style E. .each, **0.06**

H-P Insulated Bridle or distributing Rings.

Made of the best quality of Iron, heavily coated with tough glass enamel. Are readily screwed by hand, and without tools, into the most difficult and out of the way positions When desired can be unscrewed and used in other places indefinitely. Wires are easily inserted and removed at the opening on the side without injury to either themselves or the Rings.

These insulators are approved and being used by the largest Bell Telephone Companies.

Cat. No. **3580.** (Style A) H-P Insulated Bridle Rings, 1⅝ in. eye ⅜ in. opening, 1¼ in. shank, Each.....**$0.08**

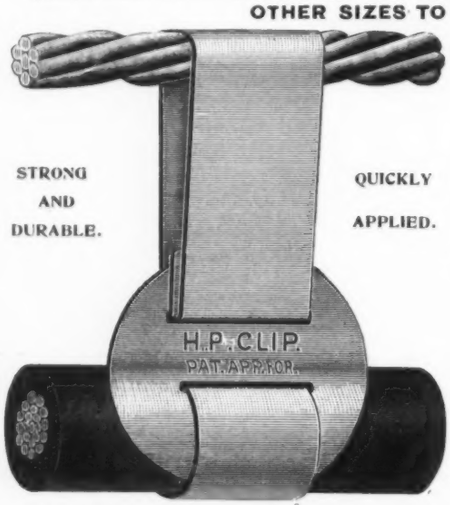
Cat. No. **3780.** (Style B) H-P Insulated Bridle Rings, 1⅝ in. eye, ⅜ in. opening, ⅞ in. shank, Each..... **0.08**

Cat. No. **3980.** (Style C) H-P Insulated Bridle Rings, 1¼ in. eye, ¼ in. opening, 1¼ in. shank, Each..... **0 08**

Cat. No. **4380.** (Style D) H-P Insulated Bridle Rings, 1¼ in. eye, ¾ in. opening, ⅞ in. shank, Each..... **0.08**

Cat. No. **4580.** (Style E) H-P Insulated Bridle Rings, ⅝ in. eye, $\frac{5}{16}$ in. opening, ⅜ in. shank, Each..... **0.05**

OTHER SIZES TO ORDER.



STRONG AND DURABLE.

QUICKLY APPLIED.

☞Contractors for anything used by Tele ' phone Companies. Write us for prices.

H-P CABLE HANGER OR CLIP.

It is made of only one piece, and that of zinc. There is therefore, no danger of electrolytic action taking place between separate parts or different metals, and no loose parts to become separated or lost. The hanger is very simple, and quickly applied. It will accomodate the several different sizes of cable. A full size cut of the hanger is here shown, gripping a ¾-inch diameter cable.

DIRECTIONS.

The circular enlargement at one end of the hanger is held against the cable, and the free end is wound around and passed through the lower slot, around the cable again, through the upper slot, up over the suspension wire and hooked into the upper slot, as shown in illustration

The hanger cannot possibly jump off the suspension wire. It grips the cable and does not allow it to slip.

Cat. No. **1481.** H-P Cable Hangers or Clips. Each **$0.02**

DISCOUNTS ON QUANTITIES.

Approximate Full Size. Catalogue No. 3580.

Octagon Steel Drills.

For Drilling Holes in Brick or Stone Work.

Cat. No. **5580.** For H-P Insulated Bridle Rings, Styles A, B, C and D Each.....**$0.55**

Cat. No. **5780.** For H-P Insulated Bridle Rings, Style E. Each..... **0.35**

JAMES S. BARRON & CO.

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Telephony.

AN ILLUSTRATED MONTHLY TELEPHONE JOURNAL

VOL. I. CHICAGO, JUNE, 1901. No. 6.

FIFTH ANNUAL CONVENTION.

The fifth annual convention of the Independent Telephone Association of the United States of America will be held at Buffalo, N. Y., on June 11, 12 and 13, 1901. This promises to be one of the largest attended conventions in the history of the association, and an unusually attractive program has been provided for the entertainment of delegates. The committee of arrangements consists of Samuel E. Wayland, Scranton, Pa., and Robert E. Hefford and Clark L. Ingham of Buffalo, N. Y. Telephony's special train will leave Chicago at 6 p. m., June 10, over the Lake Shore & Michigan Southern Railway for the accommodation of western telephone men.

The following is the program in full:

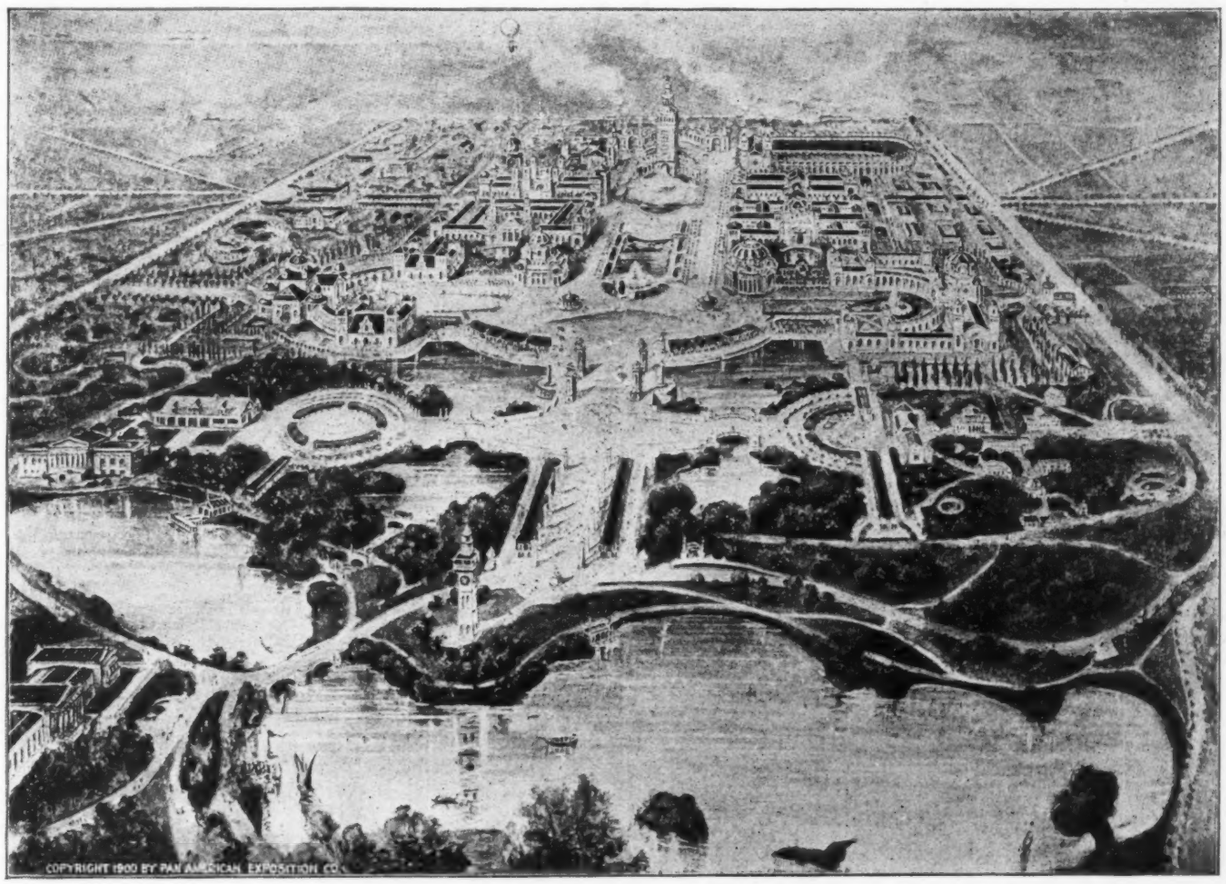
TUESDAY FORENOON.

Arrival of Telephony's special train from the West at 7:20.

Reception of delegates, distribution of badges, tickets, etc., at headquarters—Iroquois Hotel.

TUESDAY NOON.

Opening of the convention in the banquet room of the City Convention Hall, corner Virginia street and Elmwood avenue.



BIRD'S EYE VIEW PAN-AMERICAN EXPOSITION GROUNDS.

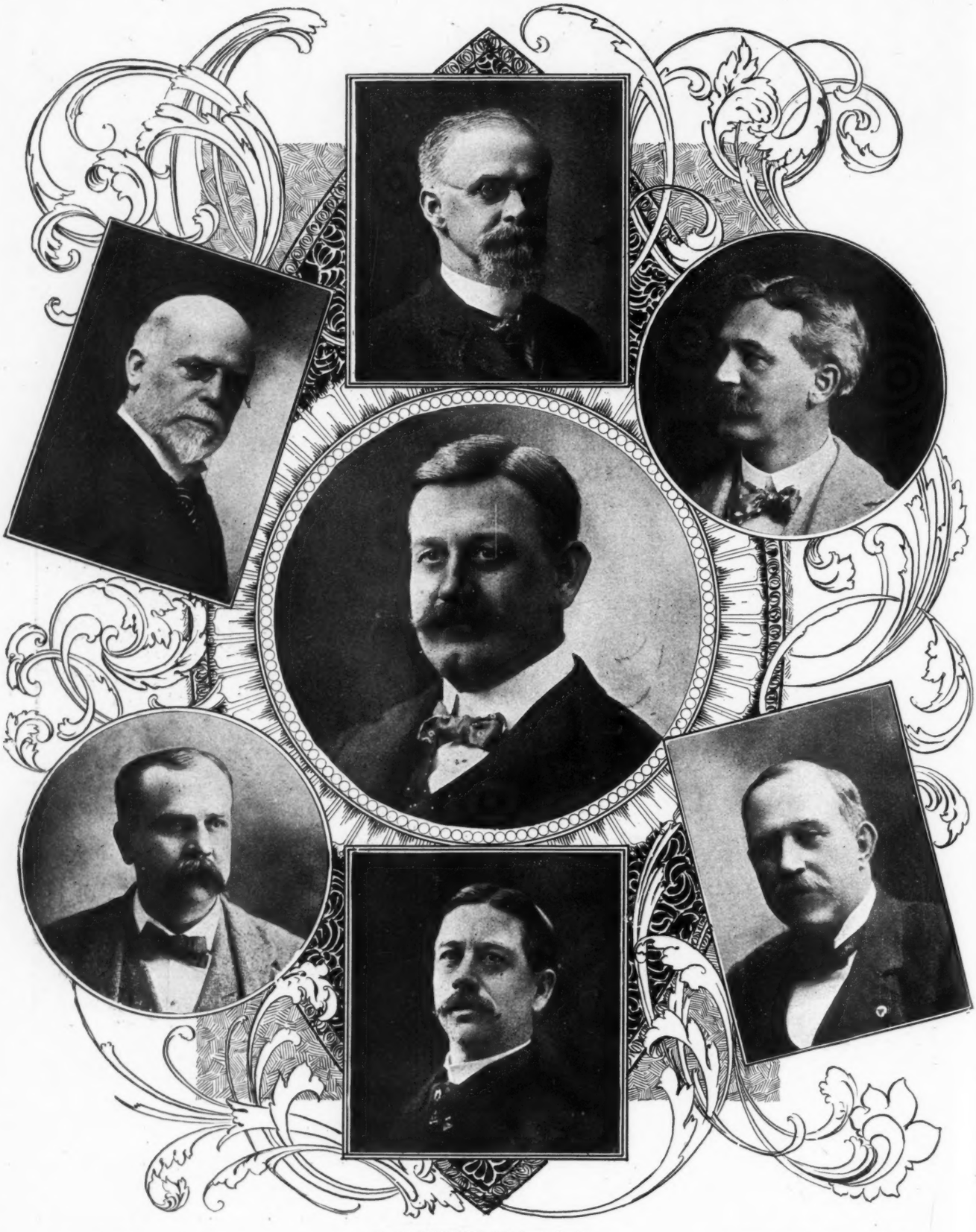
Address of Welcome—Hon. Conrad Diehl, mayor of Buffalo.

Response—By James M. Thomas of Cleveland, president Independent Telephone Association of the United States.

Annual address by the president of the Association—Hon. James M. Thomas.

TUESDAY AFTERNOON.

Inspection of exhibits made by manufacturers in connection with headquarters at Iroquois Hotel.



S. P. SHEERIN, Sec'y and Treas.
H. C. YOUNG, First Vice-Pres.

B. F. JOHNSON, 1st Asst. Sec'y.
J. M. THOMAS, President.
C. E. STINSON, 2d Vice-Pres.

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H. D. CRITCHFIELD.
W. B. SEATON.

W. H. DURIN.
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GEO. W. BEERS.

ABOVE, WITH MESSRS. THOMAS, SHERIN AND WAYLAND, COMPRISE THE

ADVISORY BOARD OF THE INDEPENDENT TELEPHONE ASSOCIATION OF THE UNITED STATES OF AMERICA.

WEDNESDAY, 10 A. M.

Paper by Hon. S. P. Sheerin, New Long Distance Telephone Company of Indianapolis. Subject, "Village Exchanges and Farmers' Lines."

WEDNESDAY AFTERNOON.

Inspection of exhibits by manufacturers in connection with headquarters at Iroquois Hotel.

Pan-American Exhibition and Niagara Falls.

NIAGARA FALLS.

Discussion by J. B. Ware of People's Telephone Company, Detroit, Mich., and T. J. Fricker of Ashtabula Telephone Company, Ashtabula, Ohio.

Paper by Chas. E. Wilson of Keystone Telephone Company, Philadelphia. Subject, "Independent Telephone Development East of the Alleghenies."

Discussion by C. E. Stinson, Rochester Telephone Company, Rochester, N. Y., and Senator C. W. Kline of Hazelton, Pa., president Inter-State Telephone and Telegraph Company of Pennsylvania.

THE TEMPLE OF MUSIC.

ELECTRIC TOWER BY NIGHT.

Paper by L. W. Stanton, Cleveland, Ohio. Subject, "Exchange Service."

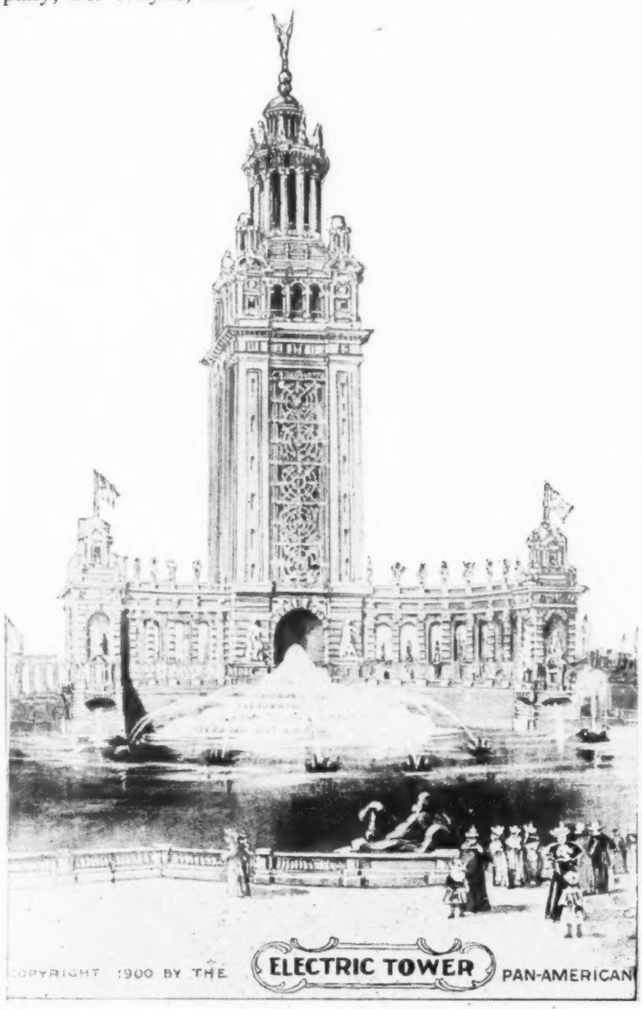
Discussion by Convention at large.

Reports from various states, and other business.

THURSDAY, 10 A. M.

Reading of paper by H. D. Critchfield, general counsel, Cuyahoga and U. S. Telephone companies, Cleveland, Ohio. Subject, "Legislation and Litigation."

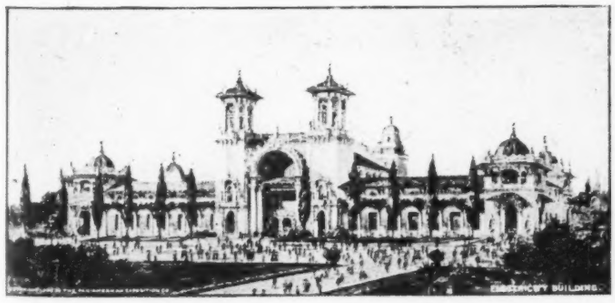
Discussion by Ed. Kibler of Newark Telephone Company, Newark, Ohio, and C. S. Bash, Home Telephone Company, Ft. Wayne, Ind.



ELECTRIC TOWER.

Reading of paper by E. B. Fisher of Citizens' Telephone Company, Grand Rapids, Mich. Subject, "Bell Methods."

Discussion by George W. Beers of National Telegraph

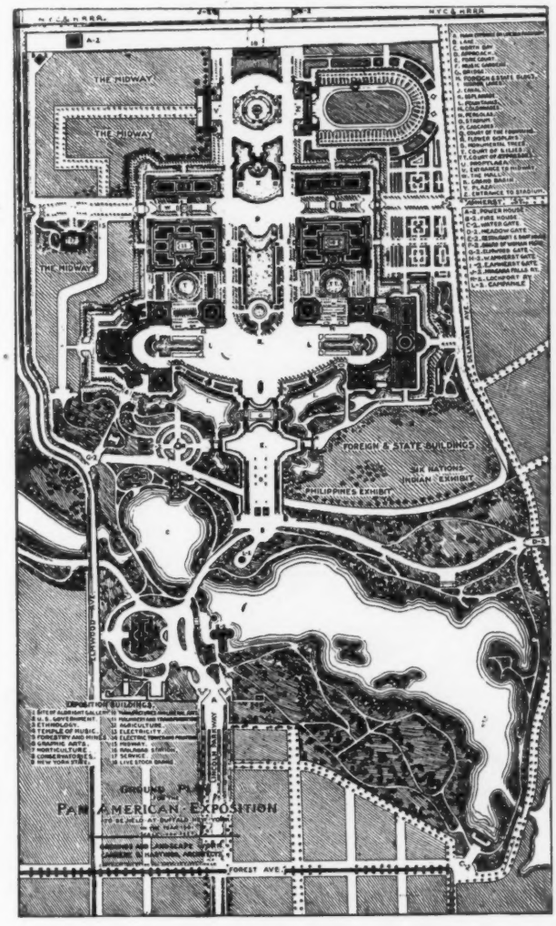


ELECTRICITY BUILDING.

and Telephone Company, Ft. Wayne, Ind., and W. A. Bisbee of Georgia Telegraph and Telephone Company, Savannah, Ga.

Election of officers and unfinished business.

The partnership between Edward E. Clement and William D. Gharky for conducting patent business has been dissolved by mutual consent. Any matters of account should be referred for settlement to W. D. Gharky, 703 Lippincott Building, Philadelphia. Mr. Clement will con-



GROUND PLAN PAN-AMERICAN EXPOSITION.

tinue to act in patent matters as attorney and counselor, while Mr. Gharky will be in practice as an electrical en-

GEORGE F. SEVER, SUPERINTENDENT OF ELECTRICAL EXHIBITS.

gineer. Both gentlemen continue as officers of the Sun Electric Manufacturing Company.

THE ROCHESTER TELEPHONE COMPANY'S EXCHANGE.

Not only has Rochester, N. Y., a world-wide reputation in the general manufacturing line of producing nothing but the very highest grade of goods in their line, but it is also widely known in the Independent telephone field as having one of the best constructed and most modernly equipped telephone plants ever built.

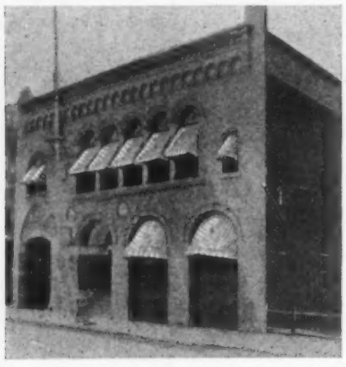


FIG. 1.—EXCHANGE BUILDING.

The Rochester Telephone Company was organized a little more than two years ago and has as its stockholders some of the wealthiest and most influential business men in that city.

The directors of the company are: Frederick Cook, Thos. W. Finucane, Geo. W. Archer, Albrecht Vogt, H. Wheeler Davis, Gustave Erbe, Geo. R. Fuller, Jacob Gerling, J. Foster Warner, Edward W. Peck, Horace C. Brewster, Eugene H. Satterlee, Willard B. Spader, V. Moreau Smith, Ezra M. Higgins.

The officers and directors of the company all having other large interests, many of whom have a national reputation in the business world, placed the entire work of building the plant in the hands of C. E. Stinson, previously superintendent of the Bell exchanges in that section, who has had over twenty years of practical experience in telephone work. Mr. C. O. Harris, another practical telephone engineer, having had many years of experience, was appointed superintendent of the construction department, and all of the other departments were put under the charge of well experienced, active assistants.

The first work was making detailed specifications of the entire system proposed, blue prints of the aerial and underground construction, and estimate of all material required, which work was completed and all orders placed for the material and apparatus early in June, 1899. Property was secured in a central location and contracts let for a fireproof building at the same time. The building shown in Fig. 1 was completed and the entire exchange constructed and completely installed and put in service, with 1,800 subscribers connected, by the following May. The building was especially constructed for a telephone exchange. The operating room was located on the second, which is also the top floor, which is lighted by large windows on all four sides and by a skylight the entire length of the switchboard. On the ground floor are the general offices, directors' room, general manager's and superintendent's offices, engineering department and construction department, with a stock room accessible from the driveway, inspector's room and trouble department.

In the rear of the ground floor is the battery and the distributing room, in which are placed distributing board, lightning arrester board, ringing generator, charging machines, storage battery plant, power switchboard, necessary equipment for making tests of subscribers' instruments and lines.

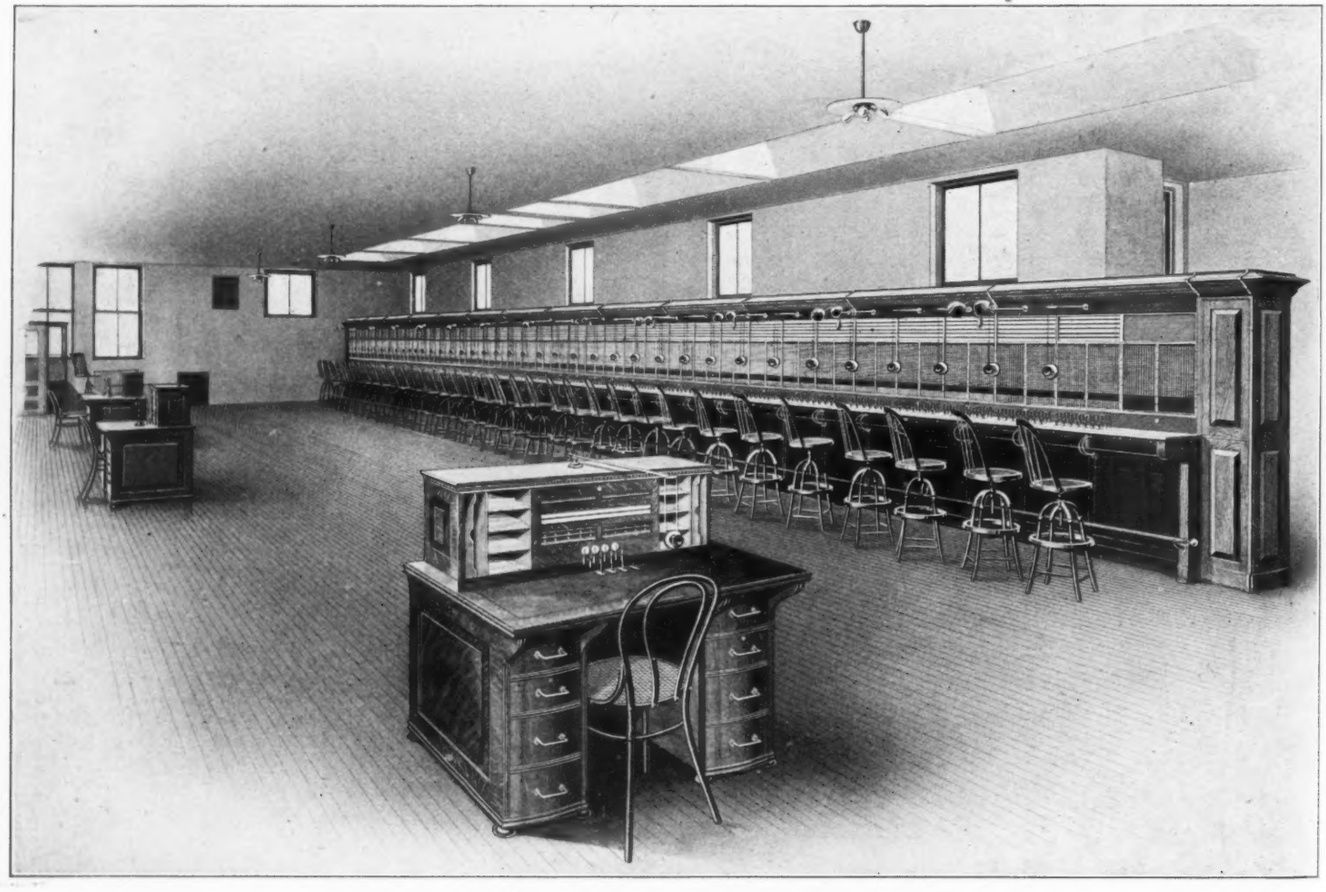


FIG. 2.—MAIN OPERATING ROOM, ROCHESTER EXCHANGE.

The cables enter the basement through conduits and are terminated in fused iron terminals. In the basement, besides the terminal room, are located the boiler room, storage room and room for shop purposes.

The construction work of the exchange is of the high-

est standard, metallic circuit throughout. The equipment was furnished by the Stromberg-Carlson Telephone Manufacturing Company of Chicago, and is of the central energy multiple switchboard type.

Fig. 2 shows the main operating room with multiple board, manager's desk, supervising operator's desk and chief operator's desk. The switchboard is fully equipped for 3,600 subscribers' lines and is arranged for 100 lines to the

FIG. 3.—SUPERVISING OPERATOR'S DESK.

operator's position. This board is of the electrically restoring visual type. The main line indicators are visual, mounted in rows of twenty at the upper part of the face of the board back of the round glass plates. Signals are raised into view of the operator automatically when a subscriber takes the receiver from the hook, and indicates the number of the line calling. The signal is automatically restored when the operator inserts an answering plug in the corresponding number spring jack. The clearing-out signals are

FIG. 4.—CHIEF OPERATOR'S DESK.

miniature lamps placed on the plug itself. Each operator's position is equipped with a pilot light placed immediately above the plug shelf on the face of the board under the answering jacks, which is lighted when a call is made, and the visual indicates in the position.

The transmitters are suspended on cords with weights on adjustable arms. The receivers are provided with a cord and plug for attaching and detaching to the switchboard positions in the spring jack underneath the plug shelf.

The manager's desk, shown in center of Fig. 2, is equipped with signals and spring jacks for lines to the various sections of the switchboard, and for connecting with any part of the offices.

The supervising operator's desk, shown more clearly in Fig. 3, is equipped with one row of 36 miniature lamps, one of which is connected with each of the operators' positions on the main board, to indicate with the pilot lamp in each position when any call is received and which remains lighted until the call is answered. The second row of lamps shown

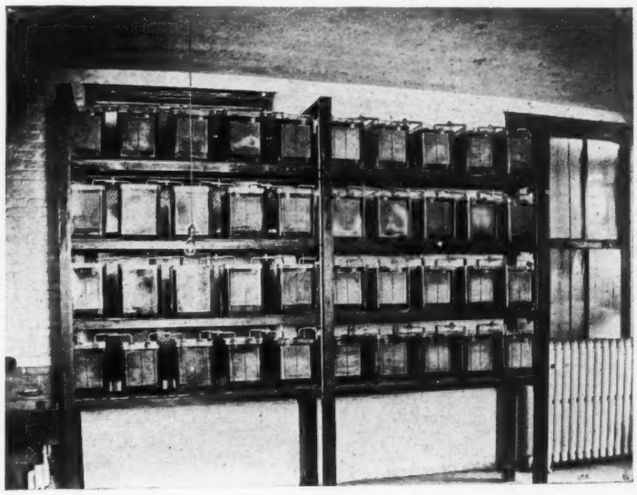


FIG. 5.—CENTRAL BATTERY PLANT.

at the top of this desk is connected one to each position on the board to indicate when the subscribers hang up their receiver, and remains lighted while the disconnecting signal is lighted on the main switchboard, showing the length of time required by each operator to disconnect the subscribers after the disconnect signal is given. The third row of lights is connected in the same manner, one with each operator's position, and is lighted when the operator rings to call a subscriber, showing the supervising operator the length of time the operator rings the subscriber's instrument, and how the subscribers are being called. This gives the supervising

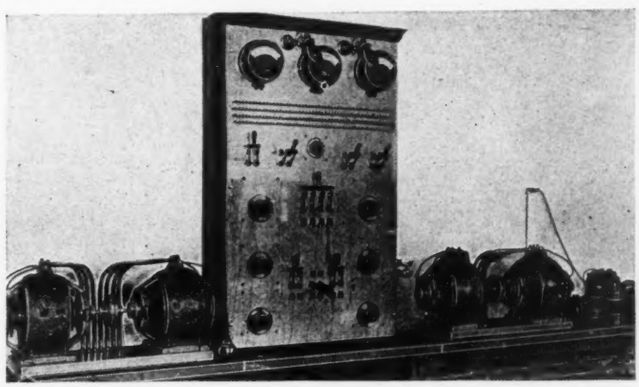


FIG. 6.—POWER SWITCHBOARD, CHARGING AND RINGING GENERATOR.

operator complete supervision at the desk of the length of time any subscriber is required to wait before being answered by the operator, and length of time the subscriber's bell rings when called from the central, and length of time the subscribers' lines remain connected after the subscribers have replaced their receivers. This desk is also equipped with signals and spring jack connected with each section of the board.

Fig. 4 shows the chief operator's desk. This desk is provided with the line signals and jacks connected with various sections of the switchboard, so that connection can be made with any subscriber or any part of the office.

With this system and arrangement of supervision, the

subscribers of the exchange not only have prompt and courteous attention from the main operators at the board, but all calls are received and connections made under the direct supervision and direction of both the well experienced and courteous chief operator and supervising operator, as well as the manager of the operating department.

The batteries of the entire exchange are located at the central office and are shown in Fig. 5. The battery plant consists of 20 cells, 360 ampere hour, storage batteries in

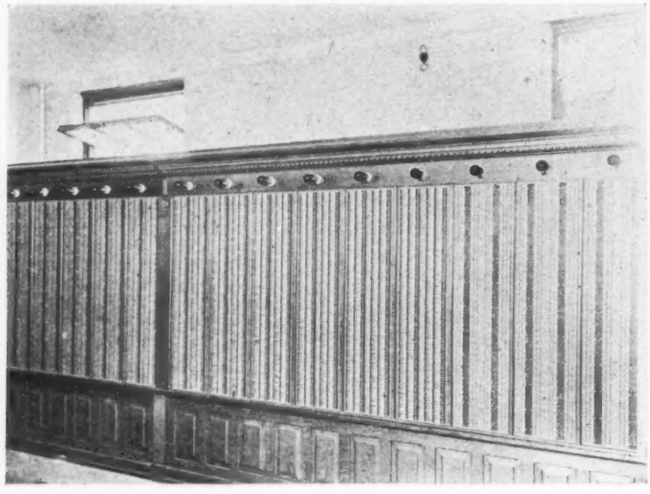


FIG. 7.—LIGHTNING ARRESTER BOARD.

duplicate. One set is used at a time and furnishes the entire battery power for all the subscribers' telephones in the system and the operators' instruments, while the other set is being charged or held for reserve. The batteries are placed in a strong and rigidly built iron rack with glass slab shelves. These batteries are of sufficient size and of ample capacity for the duplicate set operating nearly a week without recharging.

Fig. 6 shows the power switchboard, charging and ringing generator. The power board is of marbleized slate, on

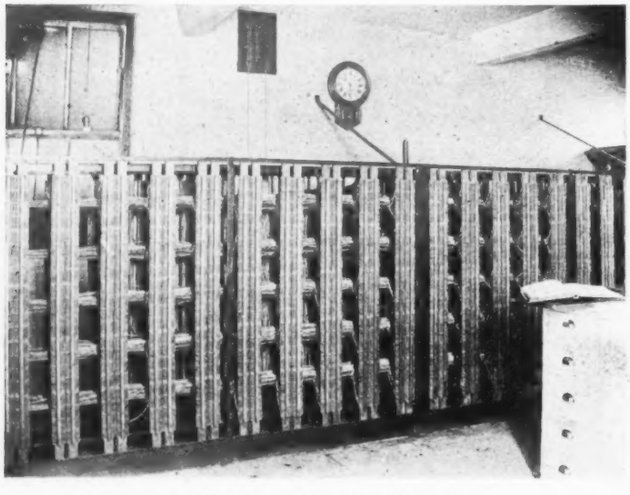


FIG. 8.—CROSS CONNECTING BOARD.

which are mounted the ammeter, voltmeters, necessary switches, rheostats, etc., for properly controlling the entire power plant. The charging machines are installed in duplicate as well as the ringing generators. so that no part of the exchange can be thrown out of service in case of accident to any one part of the equipment. The charging machines and motor generators are mounted on a strongly built stone foundation.

Fig. 7 shows the lightning arrester board. The lightning arresters are mounted in strips of 100 pairs and are set vertically in a strongly built iron rack, properly encased in finely finished quarter-sawed oak cabinet. Above each strip or 100 pair is placed an incandescent lamp, which lights immediately when a line is burnt out. This indicates at once in which strip the line is open. Besides this lamp to indicate

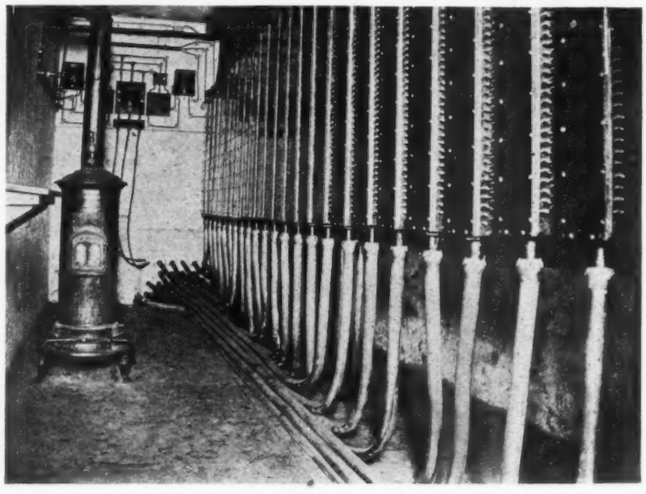


FIG. 9.—TERMINAL ROOM—UNDERGROUND.

the number of 100 in which a line is open, there is a buzzer connected with the lightning arrester case that will buzz in the terminal room, and also one in the operating room for nights, whenever a line is open on any part of the lightning arrester board. The rear of the lightning arrester case is

FIG. 10.—CIRCLE TOP DISTRIBUTION.

closed with sliding curtains, the same as the main switchboard, to prevent dust entering.

Fig. 8 shows the cross-connecting board. The cross-connecting rack is a strongly built iron frame constructed of angle iron, is well braced to make it strong and rigid. The

wire clips are mounted in strips of 100 lines and are set vertically in pairs on an iron rack and makes a neat and very convenient distributing board.

The terminal room, shown in Fig. 9, which is located in the basement, is provided with a strongly built, heavy iron rack, on which are placed the fused iron terminals, in which the outside cables terminate through conduits.

A large part of the construction and practically all of the main leads in this exchange are underground, the company having nearly 200,000 feet of underground cable, all of which were put in without an accident through the conduits of the Rochester Gas & Electric Light Company, which are occupied by both high and low tension current from 50 volts direct to 2,500 volts alternating.

In the business district of the city the cables lead from the conduits direct underground into the terminals in the building, while in the residence district the cables are led to high poles in every second block, as shown in Fig. 10, using circle tops for distribution. The distributing poles are provided with a fused iron terminal and hood. All distribution is made from the circle top terminal poles to the subscriber's station by heavy twisted rubber covered wire.

The Rochester company is considered one of the best managed exchanges in the Independent field, and while the company, when first starting, never hoped to secure more than 3,000 subscribers at the most, it has been compelled to increase its plant rapidly, and now has a 3,600 capacity switchboard practically filled, besides having a large number of private exchanges in the city, with from ten to one hundred instruments in each system, and connected with the main exchange by trunk lines. The company is rapidly extending its toll line systems throughout that part of the state.

A PARTY LINE EXCHANGE.

The Springville Telephone Company organized and commenced operation October, 1900. As they were compelled to meet party line competition with the Bell Telephone Company, they decided to meet it with a like service and commenced to cast about to see if they could not furnish their patrons a better service than that furnished by the Bell. After a thorough investigation they placed the contract with the Sterling Electric Company of Lafayette, Indiana, for equipping their exchange with their entire apparatus, consisting of switchboards, protective devices and selective signal non-interfering telephones.

They have to-day in operation one hundred and fifty subscribers, each one of which is upon a selective signal party line. Their service is in every way satisfactory to their patrons and their treasurer, Dr. Waite, writes us that in his opinion, it could not be improved upon and he deems the selective signal telephone the coming instrument of to-day.

The Queen City Telephone Company, which commenced operation in Sedalia, Mo., in January, 1901, has proved a great benefit to the telephone users of that city. The construction of their plant is modern and first-class in every respect. Their service is what is known as full metallic, each subscriber having two individual wires. Their apparatus and exchange equipment was furnished by the Sterling Electric Company of Lafayette, Indiana. It comprises a standard flash-light transfer switchboard, distributing boards, combined cable terminals and protectors, pole top treminals, cable line fuse protection and instruments.

The company commenced operation with four hundred subscribers, the service being of such a character and so satisfactory, that they have been unable to supply the demands of their new patrons. It is fully expected that before the close of this year, one thousand subscribers will be connected with service to this new and prosperous exchange.

WELL-KNOWN HEADS OF WELL-KNOWN HOUSES.

The subject of this sketch, Mr. L. G. Bowman, was born in Lisbon, Ohio, October 2, 1870. Shortly afterward he moved to Ravenna, Ohio, where he had his first experience in telephone work, beginning as night operator for the Central Union Telephone Company in 1884. From night operator he was made inspector and later went with a gang on construction work. He was transferred from Ravenna to the New England Telephone & Telegraph Company, at Boston, in 1892, where he had charge of the Newton exchange in the suburban district. He was transferred from the New England Telephone & Telegraph Company in 1893 to the New York Telephone Company,

L. G. BOWMAN.

as manager of one of the largest districts in the city, comprising the heart of the wholesale section. In 1896, realizing the advantages and openings in the Independent field, he decided to come West.

He located at Fort Wayne as manager of the Home Telephone Company of that city, which, at that time, was the largest independent plant in the country. He stayed there during the entire construction and until the plant was put in service, when he went into the employ of the Stromberg-Carlson Telephone Manufacturing Company of Chicago.

In May, 1900, he took charge of the reorganizing of the Western Telephone Construction Company. His success in connection with this company is well known to all telephone people. He has put on the market a new multiple board system, and has increased the business of the company to such an extent that it has become necessary to seek larger quarters for its factory.

Mr. Bowman is a very genial gentleman, and has a host of friends in the telephone field.

ILLUSTRATED COURSE IN TELEPHONY.

CONDUCTED BY W. A. TAYLOR.

Telephone Troubles and Their Remedies.

In connection with each drop of the switchboard is placed the night bell contacts. These are for throwing on a current when a drop falls, causing a bell or buzzer to ring. There is generally a thin German silver spring back of the shutter, and when the shutter falls this spring is pressed against an insulated contact point which is in circuit with the bell and battery. Sometimes the spring does not make a good contact and the bell fails to ring. The contact point is generally arranged so it can be screwed forward or backward in order to make adjustments; consequently do not try to bend the spring in making such adjustments, for the chances are that a bad-looking job will result.

In other forms of night alarm contacts a projecting lug on the drop comes in contact with a wire stretched along the board back of the lower portion of the shutters. There is sometimes trouble from dirt at these points of contact, which is readily removed by cleaning the contact points. Should none of the drops work the night bell when falling, the trouble must be sought in the circuit otherwise than in the drop contacts, for it is not at all probable that all the contacts are bad.

The switch may make a poor contact, the battery may be run down or short-circuited, or the wiring open at some points. To test the battery, connect it directly to the bell, and if the bell does not ring the battery is at fault. To test for open circuit in the switch, short-circuit it and see if the bell rings; if so, the trouble was in the switch. If the battery and switch are in good order go over the main leads from the battery and test for open wire.

If the night bell rings all the time there is probably a contact made at one of the drops or a short circuit in the wiring at some point. First try disconnecting the main wires from the board, and if the bell still rings it is known that the main wires are in trouble; if the bell continues to ring, disconnect each operator's position till such position is found where disconnecting obviates the trouble, and in this position will be found the short circuit. Examine each one of the shutters in this position till the trouble is found.

Cross-talk on the Board.—On some boards this trouble enters to an alarming degree. It is caused usually by electromagnetic induction. When the clearing-out drops are not of the iron-clad type the magnetic lines will radiate to the adjoining coils, reproducing the talking current in them in a manner similar to that of an induction coil.

As an explanation of the action of the way in which this cross-talk is produced, see Fig. 26. A represents a coil in a talking circuit, either bridged or in series. B is a similar coil in another circuit. Now, when the circuit in which A is placed is talked over, the core is magnetized, causing magnetic lines of force, a, b, to pass out of the ends of the iron core into the surrounding space. These lines of force are all closed lines and pass out from one end of the core and into the other end. If there is any other iron body B in the vicinity of these lines of force will tend to pass through that body, because of its greater conductivity to magnetism than the air. We therefore find that B becomes magnetized owing to these lines of force passing through it. This magnetism being caused by a fluctuating current of electricity, is also fluctuating in exactly a similar manner. Now, it is a well-known fact that if a coil of wire surrounds a core in which the magnetism fluctuates, a current is induced in the coil. Therefore, referring to the figure, we have the following: A current in the coil A produces a fluctuating magnetic field in the core, part of which field passes through the core of coil B, magnetizing the same. This magnetism induces a current in coil B, which is almost exactly similar to the current in A, and which is therefore a talking current. The cross-talk from a coil may be carried to a surprising distance—as much as 6 or 8 feet under certain circumstances. It is a very simple experiment to try how hard magnetic induction will carry. Insert a coil with an iron core in a telephone circuit and have somebody talk over the line. Right next to the coil place a similar one with a receiver in circuit. Now gradually move the coil farther and farther away. The cross-talk should easily be heard with the coils two feet apart and with a good ear and sensitive receiver at a distance at least twice as great. Now, if the coils are inclosed entirely with iron shells it will be found that not the slightest cross-talk will result, even when they touch each other. The reason is that the iron shell forms an outside path for the magnetic lines much lower than that of the air, and consequently all of them are short-circuited through the iron. There need be no fear of cross-talk from line drop coils if they are opened when a connection is made. It is only when the coil remains in the circuit that it becomes necessary to make provision against this trouble.

The only cure for this trouble is to replace these coils by those with entirely closed magnetic fields, or if this is impracticable inclose each of the coils in a metallic box, the metallic box acting as a shield.

Cross-talk Between Operators.—This trouble occurs when the operative current comes from the same battery. If the internal resistance of the battery is high, or if there is a material resistance in the common leads from the battery,

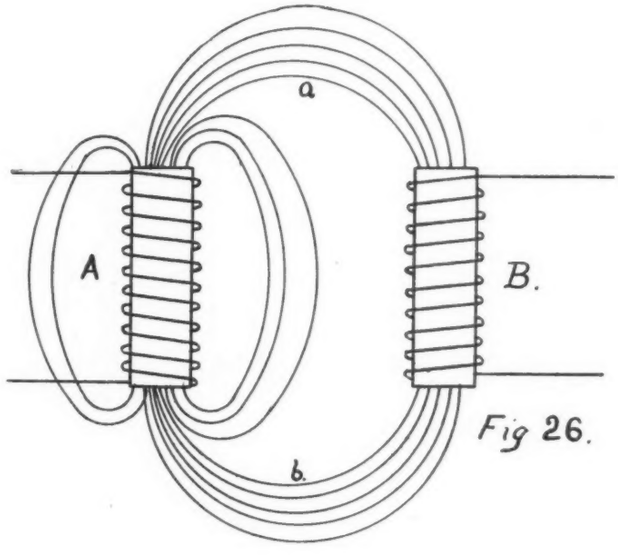
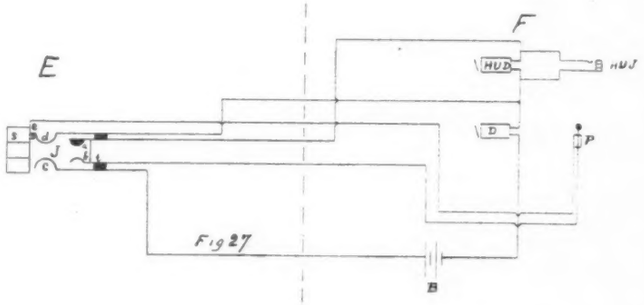


Fig 26.

the cross-talk will occur. The trouble may be remedied by putting in a battery of very low internal resistance, with large bus bars and heavy connecting wires. The ideal source of energy for the operator's current is the storage battery, but in case conditions are such that a storage battery cannot be used the better way is to provide a separate battery for each transmitter. In case the batteries on hand are of fairly low resistance, a good way to cut down the cross-talk is to connect each operator's circuit to the battery through two impedance coils, one coil being on the negative side of the battery and the other on the positive side. This last method will require an increased voltage, because of the ohmic resistance of the impedance coil. However, separate batteries are cheaper than this method.

Trunk Lines.—In boards where there are so many sections that the cords cannot reach all of the jacks, trunk lines or transfer circuits between the different sections are used. A very common trunk circuit, which is in very general use, is the Cook transfer circuit, Fig. 27. If a call comes in on a certain section for a connection which is out of reach, the operator plugs in on the transfer jack J. In so doing the tip of the plug touches the two springs c and d, which closes the battery circuit of B through the drop D, giving the signal to the operator at another section. At the same time the calling operator presses an order button over the jack J, which connects her telephone circuit to that of the other

operator. The number called for is then given directly into the ear of the other operator. As the plug passes the two battery springs of the jack J the tip of the plug separates the two springs a and b, which in turn raises c and d from contact with the plug, and also opens the contact between a and b. The plug is now connected directly with the line leading to the plug P. The second operator, seeing the drop is down, picks up the plug P corresponding to it and inserts it into the number called for. If the operator at position E should disconnect and the drop D does not operate, then in case subscriber wishes to call again, the hang-up drop H U D falls. The calling current will pass through the tip of P to the spring b of the jack J across to a, which has an insulated tip, back to H U D, thence to spring d of J through s and to sleeve of P. The operator, seeing the hang-up drop down, inserts a plug into the hang-up jack H U J and inquires, "Who called," and when told she takes down the connection and makes the one which is called for. In case D does not fall the trouble is probably due to poor contact on springs d and c, to defective battery or bad drop. If H U D does not work look for the trouble in the jack J at d or e contact, or in the drop. As H U J is in parallel with H U D, the drop should have a high impedance, so as not to interfere with transmission when a connection is in the jack. There are other trunking systems, more or less



different, some of which depend upon no signal, but consist simply of a jack at one end and a cord and plug at the other. Then the number of the subscriber and also of the trunk to be used is transmitted by the operator over the order wire.

Adjustment of Bells.—In adjusting the armature of a ringer it should be placed so that when the clapper is in the middle of the stroke both ends of the armature are equidistant from the poles of the electro-magnet, and at such a distance from the poles that the clapper does not quite touch the gongs when in the extreme position. When the bell is rung the elasticity of the hammer will allow the gong to be struck, making a clear and loud tone. When the clapper touches the gong at one or both ends of the stroke it is likely to muffle the bell by interfering with the vibration. When the line is long the armature may be set closer to the magnet, and also the gongs a little closer together. In bells to be rung by a pulsating current a spring is placed which fends to hold the armature at one end of the stroke. These bells are not intended to ring except when the current passes through the ringer in a certain direction. In order to adjust the bell so as to ring for a current in one direction and not the other, the armature should be so placed that with the spring tension on, one end of the armature should be drawn against the magnet pole. The spring should have sufficient tension so that the hammer will be thrown by it in one direction, with the same force as the current throws it in the other direction. Now, when a current passes through in the wrong direction, the tendency is to hold the end of the armature more tightly against the magnet. The pivot of the armature should be adjusted so as to have no looseness, or it will rattle. Sometimes the armature will stick to the pole of the magnet because of residual magnetism. If a brass pin be inserted in each pole of the magnet, or each end of the armature, so as to hold the armature away from the pole about one sixty-fourth of an inch, there will be no more trouble from sticking.

Sometimes it is necessary to take the receiver cap off in order to investigate trouble, and it will be found that the cap cannot be turned. Several quick raps with a piece of soft wood on the edge of the cap will generally loosen it; if not, heat the cap and it will be loosened by expansion.

Sometimes the particles of granular carbon in the transmitter become wedged or packed between the electrodes. By hitting the top of the transmitter with the palm of the hand or by shouting into it, the difficulty will be overcome.

Central can call and hear subscribers until connection is made, when the line shows short-circuited. This will happen where there are common return lines coming into metallic circuit cables and metallic circuit switchboard. If a pair of the cables become reversed the ground on that line will be connected with the line of another circuit through the switchboard, while the line of the former is connected to the ground of the latter, making a short circuit. As long as there is no connection, the operator can converse with the subscriber. The most usual source for this trouble is in reversed distributing board jumpers. In making the cross connections in the distributing board always draw up the jumper wires tightly and in neat cables, for if they are allowed to become loose and tangled the board will soon look extremely bad and will be a hot-bed of trouble. Never allow a jumper to remain upon a dead line or drop, and always keep an accurate record of all the cross connections, posting them as the cross connections are made.

It is the general rule to make out slips for all cases of trouble. These slips, the inspector or trouble man should take with him, and when the trouble is found he should make a note of it on the slip, telling what it was, where it was and what work was done. A note should also be made on the slip showing when the trouble was reported, and also when it was repaired. If the inspector is convenient to the subscriber's station he should stop in and have the subscriber sign his name, stating that the line is all right. This latter is quite important and becomes especially so where "chronic kickers" are concerned; it protects the inspector from false accusations and also gives the company a reference where rebates for poor services are demanded. The inspector should keep a day book of the trouble as it occurs, giving the exact nature of the trouble, what was done and who did it. Such books are very valuable as a reference, and from it the trouble can be taken and posted in another book, so arranged that all the trouble on each subscriber's line can be seen at a glance, as well as how long the line was out in each case. These records may seem like a needless amount of red tape, but in the end they far more than pay for themselves. They are among the handiest of the manager's reference books. To the inspector they show the weak spots of the exchange and where to go to work to improve the service.

INDEPENDENT TELEPHONE USED FOR THE OFFICIAL SYSTEM AT THE PAN-AMERICAN EXPOSITION.

The telephone system used by the officials for communicating between the various offices and buildings within the grounds of the Pan-American Exposition was furnished by the Stromberg-Carlson Telephone Manufacturing Company, and installed under the supervision of their traveling engineer, Paul M. Krohmer.

This company secured the exclusive concession for furnishing telephone service for official use within the grounds. The exchange has nearly one hundred stations and is equipped with the latest improved "central energy" system. It is said that the officials of the exposition are greatly pleased with the service and that they are satisfied they made no mistake in adopting Independent telephone equipment for their official use.

TRANSATLANTIC COMMUNICATION BY MEANS OF THE TELEPHONE.

PROF. M. I. PUPIN, IN THE ENGINEERING MAGAZINE.

The method of constructing cables and long-distance air lines for power transmission by electrical waves, particularly for long-distance telephony and telegraphy, is a practical application of the general mechanical theory of wave propagation over non-uniform conductors. The main features of this theory can be explained by a very simple mechanical illustration. Consider the figure on the next page. A tuning fork has its handle C rigidly fixed. To one of its prongs is attached a flexible inextensible cord B D. One terminal of the cord is fixed at D. Let the fork vibrate steadily, the vibration being maintained electromagnetically or otherwise. The motion of the cord will be a wave motion. If the frictional resistances opposing the motion of the cord are negligibly small, the wave motion will be approximately that seen in Fig. 2. The direct waves coming from the tuning fork and the reflected waves coming from the fixed point D will have nearly equal amplitudes, and by their interference will form approximately stationary waves. If, however, the frictional resistances are not negligibly small—if the string, for example, lies along a surface upon which it rubs as it vibrates, or if it hangs slack instead of being under tension between the tuning fork and the point of attachment—then there will be dissipation of the propagated wave energy. Hence the direct and the reflected waves will not have equal amplitudes, and, therefore, their interference will not result in stationary waves. The attenuation of the waves is represented graphically in Fig. 3. Experiments may readily be made with a cord lying along the floor, vibrated first in contact with the boards, then just free from them—first under little tension, then under higher tension. Further, experiments will show that, other things being equal, increased density of the string will diminish attenuation, because a larger mass requires a smaller velocity in order to store up a given quantity of kinetic energy, and smaller velocity brings with it a smaller frictional loss. This is a striking mechanical illustration of a wave conductor of high inductance. It should be observed here that an increase of the density will shorten the wave-length.

Suppose now that we attach a weight, say a ball of beeswax, at the middle point of the string, in order to increase the vibrating mass. This weight will become a source of reflections and less wave energy will reach the point D than before. The efficiency of transmission will be smaller now than before the weight was attached. Subdivide the beeswax into three equal parts and place them at three equidistant points along the cord. The efficiency of wave transmission will be better than it was when all the wax was concentrated at a single point. By subdividing still further the efficiency will be still more improved; but a point is soon reached when further subdivision produces an inappreciable improvement only. This point is reached when the cord thus loaded vibrates very nearly like a uniform cord of the same mass, tension, and frictional resistance. Such a loaded cord with a tuning fork attachment is represented in Fig. 4. Fig. 5 represents the vibration of a cord carrying loads at proper distances apart.

The problem of finding the proper distance at which the loads should be placed is a definite mathematical problem of analytical mechanics, but unfortunately it was never solved. Experiments with cords of this kind will soon convince one that the distance between the loads should be considerably smaller than one-half of the wave-length of the wave which is to be transmitted, so that though a given cord may be properly loaded for some wave-length, it will not be properly loaded for shorter wave-lengths. It is impossible to load a cord in such a way as to make it equivalent to a uniform cord for all wave-lengths; but if the distribution of the loads satisfies the requirements of a given wave-length, it will also satisfy them for all longer wave-lengths. It should be observed now that the wave-length which is considered here is not the wave-length of the cord without the loads, but the wave-length which the frequency under consideration will have on the properly loaded cord, or what is the same thing, on a uniform cord of the same mass, tension, and frictional resistance as the loaded cord. This point is of fundamental importance, for the wave-length corresponding to a given frequency may and generally will be much shorter on the loaded cord than on the cord without the loads.

A cord of this kind is a mechanical analogy to an electrical-wave conductor. The mathematical law in accordance with which such a cord moves is the same as that in accordance with which the electrical current is distributed over the wave conductor under the action of similar forces. The reason for that is not far to seek. We have the same reactions in both cases, viz.: Kinetic or mass reaction, tensional reaction, and resistance reaction in the case of the cord, electro-kinetic reaction, capacity reaction, and ohmic resistance reaction in the case of the wave conductor. The mathematical form of these reactions is the same in both cases, hence one is an exact analogy of the other—the mechanical a counterpart of the electrical. The loading of a telephone wire with induction coils, properly introduced, will increase its capacity for electrical-wave transmission. Wrongly arranged, they will decrease this capacity.

The insertion of inductance coils at periodically recurring points along the wave conductor or wire produces the same effect upon electrical-wave transmission as the distribution of the small loads along the stretched cord of Fig. 4 produces upon mechanical-wave transmission along the cord. The mathematical theory of wave propagation over non-uniform conductors of this kind was given by the author in a paper before the American Mathematical Society and can be found in their Transactions for 1900. This theory is, of course, at the same time the mathematical theory of wave propagation over a loaded cord described above. The main object of this theory is to find an answer to the question: *Under what conditions are non-uniform conductors described in these two sections equivalent to their corresponding uniform conductors?* The answer which the mathematical theory gives to the question just proposed is definite. To formulate it introduce here a convenient technical term. Denote the distance between two consecutive inductance points, that is, the points at which the inductance coils are introduced, by l, and let the wave-length which is to be transmitted be λ. Now introduce an angle Φ such that

$$\Phi / 2\pi = l / \lambda$$

The angle Φ shall be called the *angular distance* between the inductance points, or inductance sources. The angular distance 2π corresponds to the wave-length. The law which determines the degree of equivalence between a non-uniform conductor and its corrsponding uniform conductor can now be stated as follows: *A non-uniform conductor is as nearly equivalent to its corresponding uniform conductor as* $\sin \Phi/2$ is to $\Phi/2$.

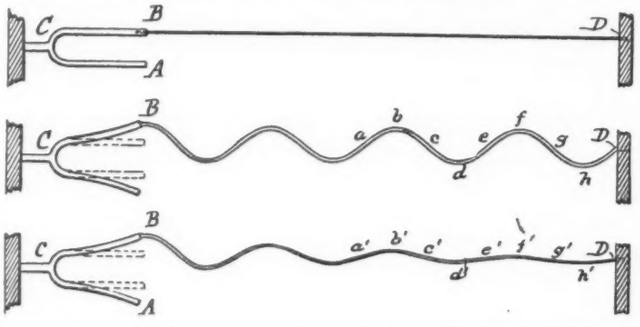
It is evident that Φ is inversely proportional to the wave-length, so that for a given distance between the reactance points the degree of equivalence diminishes as the wave-length diminishes. If a wave of complex harmonic frequency, such as occur in telephony, be transmitted over a non-uniform conductor, then the action of the conductor will be different for the different components of this complex harmonic wave. If, however, the non-uniform conductor acts with sufficient approximation as a uniform conductor toward the highest important frequency of this complex wave, then its approximation to a uniform conductor will be even higher for the lower frequencies, and thus for all the frequencies of the wave. A numerical example will illustrate this point more clearly. It is well, however, to state more fully the meaning of the expression "equivalence between a non-uniform conductor and its corresponding uniform conductor." All that we can predicate of a wave of a given frequency is that it has a certain wave-length and a certain attenuation constant. Hence, if a wave of a given frequency has the same wave-length and the same attenuation constant on a non-uniform conductor as it has on the

corresponding uniform conductor, then the two conductors are equivalent to each other. If these two quantities differ by, say 3 per cent, then an approximate equivalence up to within 3 per cent exists.

Consider now the following numerical example: A twin conductor, such as employed for telephone cables, has a length of 250 miles. Let its constants have the following values per mile:

Inductance=0.
Resistance=9 ohms.
Mutual capacity=.074 microfarads.

According to the high but definite standard which the New York Telephone Company employs, the limiting-distance of telephony over such a cable is 39 miles. According to the lower standard which is maintained in long-distance telephone work the limit would be 78 miles. The results obtained by me experimentally seem to verify these figures. I find that at a distance of 100 miles telephony over such a cable is very poor, in fact, impracticable, and at



FIGS. 1, 2, 3.—VIBRATION OF A CORD WITH AND WITHOUT FRICTIONAL ATTENUATION OF WAVES.

a distance of 125 miles impossible. It is proposed now to decrease attenuation and distortion over such a cable by the insertion of inductance coils at periodically recurring points. The attenuation constant β in this case is given by the formula

$$\beta = \frac{R}{1/2}\sqrt{\frac{C}{L}}$$

Say that it is required to have $\beta = .015$. Assume that the introduction of the inductance coils adds 9 ohms per mile, so that R=18 ohms. These values of R and C require L=.56 henrys. The attenuation factor at a distance of 250 miles would be $e^{-250\beta} = \frac{1}{40}$ (roughly). That is, 2½ per cent of the current leaving the transmitting end will reach the receiving end. This is quite sufficient for telephonic purposes; but it should be observed that better efficiency of transmission could be obtained by making L larger. Notice now that the attenuation factor for this cable without the coils would be, for a frequency of 600 p. p. s., roughly, $\frac{1}{25 \times 10^4}$ that is, with a given initial current, the current at the receiving end would be 6,000 times larger with the coils than without them.

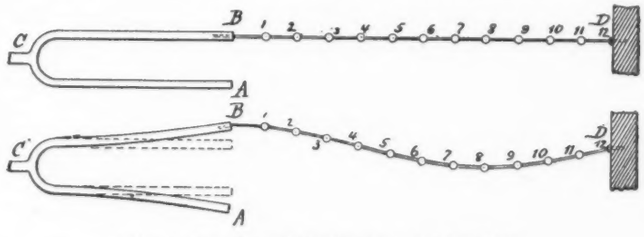
The next step is to find the wave-length for the highest important frequency in telephony over a *uniform wave conductor* having L=.056 henry, R=18 ohms, C=.074 microfarads. The best telephone practice assumes that 750 p. p. s. is the highest frequency of any importance. The wave-length corresponding to this frequency over a *uniform conductor* of this description is obtained from the formula

$$\lambda = \frac{2\pi}{p\sqrt{2LC}} = 14.6 \text{ miles},$$

approximately.

Suppose now that at each mile we place a coil of inductance L=.056 henry and a resistance R=9 ohms. The angular distance Φ for frequency 750 p. p. s. of the non-uniform conductor thus obtained will be $2\pi/14.6$. The degree of equivalence of this non-uniform conductor to its corresponding uniform conductor is measured by the degree of equivalence of $\sin \pi/14.6$ and $\pi/14.6$. Now $\sin \pi/14.6$ differs from $\pi/14.6$ by less than one per cent of the value of $\pi/14.6$; hence for a frequency of 750 p. p. s. the wave-length and the attenuation constant on the non-uniform conductor will differ from the wave-length and attenuation constant on the corresponding uniform conductor by less than one per cent of the values of these constants. Such a difference cannot be detected by any of the experimental methods which are at present available for investigating wave propagation. In telephonic transmission the ear could not detect it. For lower frequencies the differences will be even considerably smaller. Hence, the non-uniform conductor thus obtained will represent a uniform, non-attenuating, distortionless conductor for telephonic transmission.

It should be observed here that in the case of a submarine cable of, say, 2,000 miles, the attenuation constant should be much smaller than the value of β given above, in order to have a sufficiently small attenuation factor. Now the capacity per mile of a submarine cable is about four times as large as the capacity of the telephone cable just described. Hence, both on account of the long distance and also on account of the much increased capacity, the inductance per mile will have to be much larger than in the case just discussed. But high inductance and large capacity will give a very short wave-length. For instance, if in the case of the submarine cable having six times the capacity we employ an inductance six times as large as in the case of the telephone cable we shall obtain for the frequency of 750 p. p. s. a wave-length of only 14.6÷6=2.43 miles. Hence, since the inductance coils will have to be placed apart at one-sixth of the distance employed in the case of the telephone cable, the distance between them will be about 880 feet. The distance between



FIGS. 4 AND 5.—VIBRATION OF A LOADED CORD.

the inductance coils depends entirely on the circumstances of each particular case. But in all cases the rule given above contains the necessary and sufficient directions.

This rule and the method based upon it are recommended by my mathematical theory for the construction of distortionless wave conductors of high efficiency of transmission.

To determine how far the mathematical theory was confirmed by experiment, a so-called artificial cable was constructed. The cable had 250 sections, each consisting of a sheet of paraffined paper. On each side of this sheet was a strip of tinfoil. The resistance of this strip is approximately 9 ohms. The capacity of the condenser formed by the two strips is .074 microfarads approximately; 250 sections of this kind connected in series represent a cable of 250 miles in length, having a resistance of 9 ohms and a capacity of .074 microfarads per mile. The twin inductance coils consisted each of two coils wound on one spool 125 mm. diameter by 125 mm. high, and separated by a sheet of cardboard 1-64th of an inch thick. The coil when finished was boiled in beeswax at a temperature of about 280 degrees Fahrenheit, in order to drive all the moisture out and insure good insulation. Each coil had 580 turns of No. 20 wire B. & S. The average inductance of one of these coils is .030 henry, and the mutual inductance .028 henry. Each coil, therefore, when connected into the line, has an effective inductance of .058 henry.

The connection of the various sections to one another, either direct or through inductance coils, is controlled by plugs. The plugs being in, the coils are short-circuited, and

the consecutive sections are connected to each other directly; the plugs being out, the consecutive sections are connected through the intervening coil. The former case gives the uniform cable, corresponding to the unloaded string; the latter case gives the non-uniform cable of 250 miles in length with an inductance coil inserted at each mile, corresponding to the vibrating string loaded with the waxen balls.

The object of the experimental research performed with this cable was to determine the electrical wave produced in it by the action of a harmonic electromotive force. A wave curve of this kind enables measurement of the wave-length and the attenuation constant, and comparison of the results thus obtained with the mathematical theory. The work was actually done and it was found that theory and experiment agreed very satisfactorily.

It was shown further that when the distribution of the inductance coils over the cable does not render the cable approximately equivalent to its corresponding uniform conductor, there will be serious internal reflections which will diminish the efficiency of wave transmission.

For this purpose the inductance coils were connected in groups of ten; one of these groups was inserted into the cable every ten miles; the total inductance of the cable was now the same as before, but the distribution was quite different. A simple harmonic e. m. f. of 260 p. p. s. was impressed upon the cable. The wave-length of a wave of this frequency on the corresponding uniform conductor was found to be 41.4 miles, so that the inserted inductance coils were apart at a distance which is equal to about one-quarter of the wave-length on the corresponding uniform conductor. The degree of equivalence between this non-uniform cable and its corresponding uniform conductor is very small. It was found that the attenuation in a cable loaded in this manner was *greater* with the coils than without them. In other words, coils introduced improperly are barriers to electrical waves, and therefore they injure the efficiency of transmission.

These experimental results left no doubt as to the correctness of the prediction of the mathematical theory. Actual experimental tests with transmitters and receivers which were kindly put at my disposal by the New York Telephone Company, for which I feel very grateful to them, verified these predictions completely. Telephonic communication over the whole of the cable was carried on with perfect ease. Both the volume and the articulation of the transmitted sound were all that could be desired. If, however, the inductance coils were cut out and the cable used as a uniform cable, then the transmission was good up to 50 miles, fair up to 75 miles, impracticable at 100 miles, impossible at distances over 112 miles. Increased distance interferes with the transmission over the uniform cable, not only on account of the diminished volume of the sound transmitted, but also on account of the rapid loss of articulation. This manifests itself at first as an apparent lowering of the pitch of the voice, just as the theory demands. My assistant's voice is of an ordinary pitch, if anything a little above the pitch of the average man's voice. When it was transmitted over 75 miles of the uniform cable (that is, the coils being disconnnected from it) it sounded like a strong baritone. Over a distance of 100 miles it becomes drummy (this is an expression borrowed from telephone engineers) that it was difficult to understand it, unless nothing but ordinary conversation was carried on, and then very slowly, and the speaker had to put his mouth as close to the transmitter as possible and speak out as if he were addressing a big audience. At distances over 112 miles nothing but the lowest notes of the voice could be heard; the articulation was entirely gone. When the coils were all in, then no drumminess in the voice was noticed, and the conversation could be carried on as rapidly as one chose to do. I understand that in long-distance work three galvanic cells of the same type of which I had two only were formerly employed by the American Telegraph & Telephone Company when they employed the old system of transmission.

The effect of internal reflection is illustrated even more strikingly by telephonic transmission than it is by the exploration of the waves. The same distribution of coils was used for telephonic transmission as described above in connection with the internal reflection experiments—that is, a group of ten coils each at distances of ten miles apart. A distance of a hundred miles of the cable was employed. Telephonic transmission over this distance was absolutely impossible, although the lowest note in the voice was transmitted quite vigorously, and sounded like the muffled beating of a big drum. Another distribution of the coils was now tried. The coils were divided into groups of five, and these groups were put into the cable at points five miles apart. Transmission over a distance of a hundred miles became intelligible, though with much difficulty; but it was not as good as over the cable without the coils. The drumminess was even more excessive in the former case than in the latter. One had to put his mouth very close to the transmitter, speak very slowly, very loud and about very ordinary things, otherwise the meaning of the transmitted intelligence would not be caught at all. But if the same distance of cable was employed with the inductance coils placed one mile apart, as the mathematical theory suggests, then the voice of the sender sounded just as if he stood right before the receiving operator. It was not necessary to stand near the transmitter at all, in order to be heard at the other end. There was no difficulty in making the receiving operator understand, even if the transmitting operator stood anywhere in the room at a distance of twenty feet or more from the transmitting instrument. The effect of the inductance coils properly distributed over the cable upon the efficiency of transmission astonishes even one like myself who has now worked for years upon and made himself perfectly familiar with this fascinating problem of electro-mechanics. The inductance coils which I employed contained no iron. Coils with iron cores to be used for this purpose will have, of course, to be constructed in a perfectly definite way to work satisfactorily. I expect to bring this matter before the American Institute of Electrical Engineers in the near future. Suffice it to state now that such coils will be required in the construction of non-uniform submarine and underground telephone cables, on account of the much smaller volume per unit of inductance.

The practicability of such coils has been satisfactorily demonstrated in my laboratory, and coils of this kind are now in the course of construction, intended for loading overland lines of 1,800 miles in length. The method has been very thoroughly tested by the American Telephone & Telegraph Company on a line 715 miles in length, and found to work quite satisfactorily. The saving in wire on this particular circuit was about 64 per cent. but much better results are obtainable. There is very little doubt about the possibility of telephoning by this method over a distance of 4,000 miles, using the present standard long-distance wires, over which telephony is now possible at a distance of 1,000 miles, and there is no reason to doubt the practicability of telephoning across transatlantic cables properly loaded. The cost of such cables will not be more than 25 per cent over and above the cost of the cables of the present type. Some mechanical difficulties will be met, of course, but they do not seem to be very serious.

Further, and by no means least important, is the obtainable improvement in telegraphy. A line which is reasonably good for telephony is excellent for rapid telegraphy. The means which would make conversation across the ocean possible would fit a transatlantic cable for the use of systems of rapid telegraphy, enormously increasing its business capacity. In view of this gain, the additional expense of installation would be a trivial matter.

They are very progressive in France.

A cable dispatch from Paris notes a decree from the high government official in charge of the Postal Telegraph Department that hereafter the telephone girl must not echo the "Allô!" of the person who "rings her up."

QUESTIONS AND ANSWERS.

Exchange men are invited to submit to the editor of this department questions of general interest, which will be promptly answered. Address all communications to Question and Answer Department, Telephony.

H. B. W. writes: "How long will the carbon element of a carbon zinc battery last in ordinary exchange service? Can the carbon be cleaned, if so what is the best method?"

There is no reason why the carbon element will not last indefinitely with ordinary usage. A good carbon should not deteriorate. The function of the carbon is to act merely as a conductor and carbon is used because it is not attacked by the chemical. In case the liquid is allowed to evaporate and crystallize the carbon will be filled with the crystals and lose its conductivity. In such a case soak the carbon in warm water for twenty-four hours, changing the water several times. When a cell is taken out of use, the carbon should always be soaked in water for a day. The chemical should never be allowed to dry into the pores.

Does it make any difference in the transmission in which direction the current passes through a transmitter. F G H.

There are a large number of telephone users who think there is a difference but if those parties were to try it themselves they would certainly find no difference. The writer has tested hundreds of transmitters both in exchange and in the laboratory and never detected the slightest difference. The idea is probably one of the traditions of the trade. On the face of the matter one should be able to see, for there can be no doubt that there will be just as much current flowing in one direction as in the other with a given voltage, for the resistance is the same. There is, however, one case where the matter of current direction should be taken into consideration, and that is in common battery systems where the receiver and transmitter are in series with each other or where the primary current passes through the receiver. In this case the current should flow in such a direction through the receiver as to strengthen rather than weaken its polarity.

R. P. J. writes:—"Electrical conditions only being considered, would the larger the better, be true for long iron or copper telephone lines?"

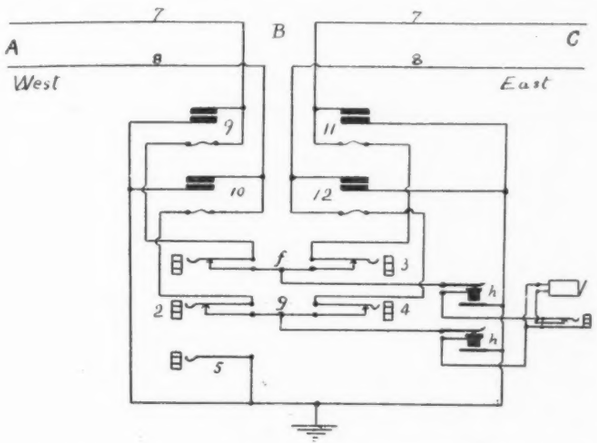
As the transmission of telephone currents depends upon and is proportional inversely to the capacity and resistance of the line we have two considerations; one that when the wire is increased in size the capacity is increased owing to the larger surfaces presented and therefore a poorer transmission; on the other hand the resistance is smaller, hence the conductivity is increased. However, as the conductivity increases a great deal more rapidly than the capacity, we may conclude that the larger the wire, electrically considered, the better the results. With the method of Prof. Pupin where he eliminates the element of capacity, the resistance is the only interfering trouble, and, consequently, the rule of the larger the wire the better, holds true absolutely. Of course, on all ordinary lines the capacity will become so great on very long lines that a limit will be reached even with large wires when the voice current becomes so distorted as to preclude talking. In iron wire even though it were large enough the transmission would not be as good as copper because of its larger surface and consequently greater electrostatic capacity.

We print a diagram and explanation of the American Telephone & Telegraph Company's "Test Panel" circuit, from R. A. D. of Booneville, Ind., who thinks that J. M. C.'s question may refer to this.

Both ends of the wires 7 and 8 are dead-ended on the cable pole at B, and carried through arresters 9 and 10 and 11 and 12 to jacks 1, 2, 3 and 4. Wire number 7 is made continuous by connecting a wire f, between jacks 1 and 3, and 8 by wire g, connecting 2 and 4. The drop is bridged between f and g.

Now, to test the line let us suppose that it is grounded somewhere between a and the other end. The wire chief at A will instruct the operator at B to open 7 and 8 west. This is done with two short cords having a plug on each end, one end of each being inserted in jacks 3 and 4. If the noises cease it is the sign that the trouble is beyond B. Should the noises continue it would indicate that the trouble is between A and B, and the operator is instructed to open east, which is done by putting the plugs in jacks 1 and 2. If the wire chief at A can no longer hear a noise on the line it would seem that the trouble is in the office, probably in the carbon arresters.

However, if no noise is heard, if the line is open west,



the operator is instructed to "strap through;" that is, connect jacks 1 and 3 and 2 and 4; this cuts out the heat coil h and the drop which would otherwise interfere with a resistance test. This process is continued till the trouble is located between two offices and then a resistance test is made and a man sent out from the nearest office. Supposing that the wire chief is at the east end of the line, each operator is instructed to open west as soon as she finds the line in trouble. This leaves the section of the line east of each station connected to the drop. As soon as an operator has opened west she signals for A, and if no operator east of her has opened the line she should report the trouble to the wire chief. Suppose each operator has opened west, the wire chief will signal B, telling her to strap through, and so on down the line till the trouble is found.

This is a very valuable arrangement to have on toll lines, as it facilitates the work enormously, taking the work of testing out of the hands of those who generally are incompetent to make satisfactory tests.

W. R. L. D. asks: "First, does it injure the strength of galvanized iron line wire to solder it with a blow torch any more than to solder it with the usual melting pot and ladle.

"Second: What is the supposed advantage of the felt packing rings used in many forms of transmitters.

In answer to the first question; a great deal depends upon who does the soldering. We should think that if the wire is not heated too hot it would be just as well to use a blow torch. The most to be feared in using a torch is that the galvanizing will be burnt off, leaving the bare iron to rust. If a high-grade steel was to be soldered with a torch it might be burnt or the temper drawn and in that manner the tensile strength reduced.

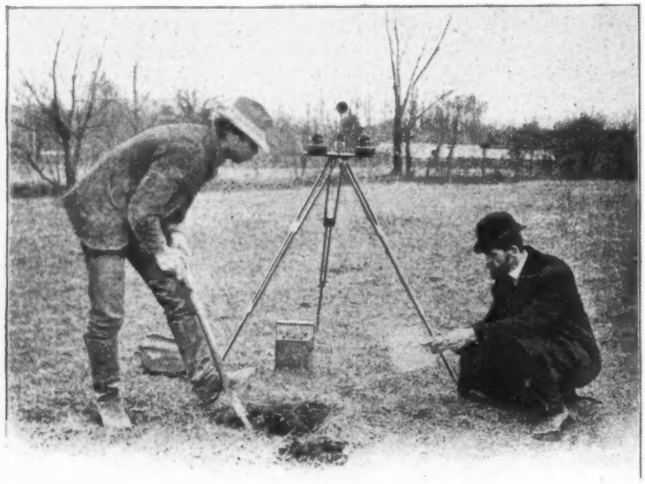
Second: The felt rings are used for insulation and for retaining the carbon granules, and as the insulation must be easily compressed and at the same time be elastic, felt is used. In a number of transmitters flannel is used in place of the felt. Whether the use of the felt ring type of transmitter is advantageous or not largely depends upon how well it is made and upon individual tastes. All styles have their champions.

TALKING THROUGH THE EARTH.

F. S. LIVINGSTONE AND CHAUNCEY M'GOVERN, IN PEARSON'S MAGAZINE.

Mr. Marconi's much-talked-of method of telegraphing without wires—wonderful as it is—seems almost crude when compared to the invention of Mr. A. Frederick Collins, a young electrical engineer of Philadelphia.

Mr. Collins has invented a means of telephoning—that is, of sending *spoken* words—from any one place in the world to any other place, without the use of intermediate wires, not through the air, but through the earth. Of course, Collins can also, like Marconi, send dots and dashes by the same apparatus, but while in the Italian's system there must be a 100-foot pole at the dispatching point, and a 100-foot



pole at the point of receiving, each supplied with a 100-foot wire running from the top of the pole into the ground, the apparatus required for the American's system is so extremely small that you can fold up the whole thing in five minutes and carry it off in an ordinary dress suit case.

Nor are the extreme simplicity and compactness of the new telephone system its only wonders. A telephone message sent by the wireless telephone can be heard more plainly than one sent by the regular "wire" telephone now in commercial use. And with the Collins invention you can telephone to places that "wire" 'phones cannot reach. That which now requires miles and miles of costly wires, thousands of costly poles, millions of dollars for land purchases, franchises, and rights of way, Mr. Collins has succeeded in coaxing the earth to do, not only as well, but better and for nothing.

So extremely cheap is both the installing and the operating of the Collins plan, that it seems destined to place the use of a telephone within the easy reach of the poorest householder anywhere—in the country as well as in the town.

Mr. Collins cannot lay claim to the discovery of any new scientific principle. What he has done is simply to take a well-known scientific fact—that the earth itself is abounding with electricity—and conceive the idea of using these currents to convey from one point to another the sound of the human voice.

Like nearly all other young inventors, he had little money of his own. But he had plenty of determination, and within two weeks of the conception of the idea he had induced twelve capitalists to form a company, and put up all the money required to make a practical test of his theoretical principle. Fortunately, his theory proved right. In a few months Mr. Collins had finished a wireless telephoning outfit which enabled him to speak—without using any visible connection—from one end of a big office building in Philadelphia to the other.

Within a single year of first beginning his experiments he had telephoned without wires across the Delaware River at Philadelphia—a distance of over a mile. The words sounded as clear and sharp as if they were being uttered by a person but a few yards away.

To show that the new system works as well through the earth as through water, Mr. Collins extended to the writers a special invitation to his proving grounds at Narberth, Pa.

When we had picked out the spot at which to set up the sending machine, Mr. Collins placed on the ground the storage battery which had been brought from his laboratory. The only other things carried were a packed dress suit case, a spade, and a small hand satchel.

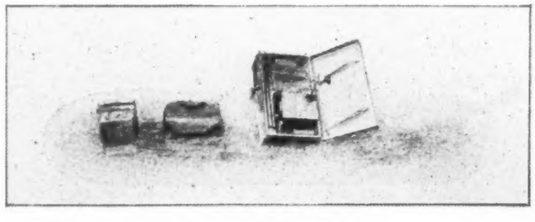
Opening the case, Mr. Collins drew out an ordinary camera tripod. To the top he screwed a piece of board a foot square, on one side of which was elevated on a brass rod a cup-like "transmitter," such as is used in ordinary telephony. Then he took from the case and placed on this board two small "intensity coils" inclosed in hard rubber. Between these he placed three pieces of copper sheating—"condensers." These things, with a few cents' worth of wire to connect them, were all the apparatus placed on the tripod.

A shallow hole was dug in the ground just below the tripod, and in it was placed a small zinc wire screen. After connecting this buried screen to the coils by a wire and running a second wire from the battery to the coils, all was in readiness as far as the *sending* of a wireless telephone message was concerned.

At a distance of about a mile a second tripod was set up, and a small box containing all the "receiving" mechanism was screwed into place. A second hole was dug, a second zinc screen buried in the ground, a short wire connected the screen with the mechanism inside the receiving box, and nothing remained for the hearing of a wireless telephone message but to turn on the power from the storage battery.

When the electricity from the battery was turned on sounds of all kinds were sent through the transmitter and heard as distinctly at the receiving station a mile away as though through an ordinary telephone.

What made such an interesting thing possible was this: All the time that the battery was turned off there was a natural flow of electricity from machine to machine. More cor-



THE ENTIRE OUTFIT.

rectly speaking, the two machines stood above a natural current in the earth, and these currents are in evidence all over the earth's surface. But the moment the artificially generated electricity in the storage battery was turned into the coils, these coils intensified the natural currents from six to one thousand volts, and this terrific force was sent into the ground through the wire leading from the coils to the metallic screen buried in the ground.

The screen buried below the receiving machine is a duplicate of the screen in the ground below the transmitter. The electrical disturbance set in motion by the screen at the sending point is carried with the velocity of light, by the earth's natural currents, in the direction of the second screen. This second screen intercepts the disturbance, and through the short connecting wire every movement of the disturbance is recorded on a little metal diaphragm, hidden away in the inside of the receiving box.

This disturbance is of a perfectly even quality when the instruments are not being spoken into. But if some one *talks* into the cup-shaped object on the sending machine, or speaks

in a loud voice *near* it, or plays a cornet or beats a drum near it, the sound creates a new commotion in the already existing disturbance. The consequence is that the disturbance heard at the receiving station is of a slightly different character. The sensitive little diaphragm at the receiving point yields to every infinitesimal variation in the commotion, and thus reproduces the words or sounds exactly as in the case of the ordinary telephone.

When the writers had their ears to the receiver there was not the least buzzing noticeable, and everything was

MR. COLLINS TALKING INTO HIS WIRELESS TELEPHONE.

heard as clearly and in much the same tone as if being listened to within a few yards of the speaker, without the intervention of anything but air.

The apparatus just described will not send a message *back*. Messages over it are sent but *one* way. We have described his apparatus, however, because it embraces the invention reduced to its barest principles. For a person at the receiving station to talk *back* to the person at the transmitter he is listening to, he must have at hand an apparatus exactly like the apparatus used by person No. 1. In turn, person No. 1, to *hear* a message from the receiving station, must have a separate receiving apparatus near his ear.

In actual practice, however, a transmitter is constructed with a receiving annex, and the receiver is in turn equipped with a sender, so that so far as the casual user is concerned, the wireless telephone seems to work exactly like the telephones in everyday use. The wireless telephones in use in the inventor's building in Philadelphia are of this combination type.

As already intimated, Mr. Collins can also telephone without wires by using water as a medium as well as by using the clay portions of the earth. The experiments which he had recently carried on across the Delaware River he reproduced on a small scale in his laboratory to demonstrate how his invention works when water is used as a medium.

Mr. Collins had placed in his laboratory a long, wooden trough half filled with water from the regular city supply. The wireless telephoning sender was placed at one end of the trough—which was some fifteen feet long—and the receiver in a room adjoining the trough's farther end. There was absolutely no wire communication between the sender and the receiver. A small piece of wire from the sending machine *touched the water* at one end of the trough, while a similar small piece of wire from the receiving machine touched the water at the farther end of the trough. In no place, however, did the wires touch each other, at no time did they come within fifteen feet of each other. Yet when one of the writers stood in the adjoining room, with the receiver to his ear, he could not only hear the inventor speak, and more distinctly than through an ordinary telephone, but the writer *could hear the inventor's breathing*.

Afterward the inventor made a curious demonstration. As everybody knows, glass is considered by our scientific authorities to be a perfect non-conductor of electricity, and that it is for this reason that those beehive-shaped glass objects are used on telegraph and telephone poles. But the experiment made by Mr. Collins in his laboratory seems to show that there is some fallacy in this scientific belief.

Leaving both the sending and the receiving machines in exactly the same positions that they occupied during the other tests, Mr. Collins took the short piece of wire running from the sending machine and put the end of the wire into a small-necked glass bottle. Then he placed the bottle upright in the trough of water. In no way did the wire touch the water—the top of the bottle was four inches above the height to which the water in the trough attained.

Next, the little bit of wire running from the receiving machine was placed in a second glass bottle, and the bottle placed in the trough like the first bottle, without the wire

RECEIVING THE MESSAGE AT A DISTANCE OF ONE MILE.

within coming anywhere in contact with the water. This means that not only were the two wires separated by fifteen linear feet of ordinary water, but there was also separating the two wires two glass bottles.

Yet when the inventor talked through the sending machine the writer heard him clearly through the receiver in the adjoining room. In other words, glass, instead of stopping the flow of electricity between the two machines, made the electricity flow all the more readily!

Mr. Collins has set up on the wall of his laboratory, close together, three small portraits. They are of Edison, Marconi, and Tesla. Perhaps some day some other young man will do the same, and add one more portrait—that of Collins.

Another important change in the Independent telephone field of Michigan took place May 17, by which the Owosso Telephone Company and the Union Telephone Company consolidated.

Telephony.

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AN INTERVIEW WITH JUDGE THOMAS.

Hon. James M. Thomas, president of the Independent Telephone Association, in a recent interview with a representative of this publication, said, in reply to a request for his opinion as to the outlook in the Independent field:

"The outlook at the present time is most promising for the Independent interests. It is impossible to keep track of the Independent exchanges, so rapidly are they increasing, while toll lines are being built in every direction. Long-distance lines are being built to connect many of the large cities, and the manufacturers are unable to fill orders, so great is the demand for Independent apparatus."

In speaking of the coming convention, Judge Thomas said:

"Buffalo is an ideal place for holding this year's meeting. With the added attraction of the Pan-American Exposition and Niagara Falls, the attendance should be large. Then the field has grown bigger and broader, and these annual gatherings are being more appreciated each year.

"As to the situation in the East," said the judge, continuing, "there will be important developments very shortly. An Independent exchange in New York and Boston is now assured. The Knickerbocker Company will build a modern Independent exchange, while the Massachusetts Company will push work on its plant with all expediency. Long-distance lines will be built from Boston east, connecting New York, Philadelphia, Buffalo, Baltimore, Washington, Pittsburg, Cleveland, Detroit, and entrance to Chicago in the near future as among the probabilities. The exchange men of New York state will organize a state association during the coming convention."

The judge touched on a number of other things during the interview. He believes the decision in the "Carty" patent case will be in favor of the Independents. Independent properties are in fine condition and having their share of prosperity. All things considered, the judge seemed to think Independents have a great deal to be thankful for.

THE BUFFALO CONVENTION.

The fifth annual convention of Independent telephone men, to be held in Buffalo, June 11, 12 and 13, will in all probability be the largest in the history of the organization. The program, which is printed below, as well as on pages 177-181, of this issue, is unusually attractive and promises a surfeit of good things. The reason for its reprint is to have it in concise shape for easy reference.

The program in full:

TUESDAY FORENOON.

Arrival of Telephony's special train from the West at 7:20.

Reception of delegates, distribution of badges, tickets, etc., at headquarters—Iroquois Hotel.

TUESDAY NOON.

Opening of the convention in the banquet room of the City Convention Hall, corner Virginia street and Elmwood avenue.

Address of Welcome—Hon. Conrad Diehl, mayor of Buffalo.

Response—By James M. Thomas of Cleveland, president Independent Telephone Association of the United States.

Annual address by the president of the association—Hon. James M. Thomas.

TUESDAY AFTERNOON.

Inspection of exhibits made by manufacturers in connection with headquarters at Iroquois Hotel.

WEDNESDAY, 10 A. M.

Second Session of the Convention at Convention Hall.

Paper by Hon. S. P. Sheerin, New Long Distance Telephone Company of Indianapolis. Subject, "Village Exchanges and Farmers' Lines."

Discussion by J. B. Ware of People's Telephone Company, Detroit, Mich., and T. J. Fricker of Ashtabula Telephone Company, Ashtabula, Ohio.

Paper by Chas. E. Wilson of Keystone Telephone Company, Philadelphia. Subject, "Independent Telephone Development East of the Alleghenies."

Discussion by C. E. Stinson, Rochester Telephone Company, Rochester, N. Y., and Senator C. W. Kline of Hazel-

ton, Pa., president Inter-State Telephone and Telegraph Company of Pennsylvania.

Paper by L. W. Stanton, Cleveland, Ohio. Subject, "Exchange Service."

Discussion by Convention at large.

Reports from various states, and other business.

WEDNESDAY AFTERNOON.

Inspection of exhibits by manufacturers in connection with headquarters at Iroquois Hotel.

Pan-American Exhibition and Niagara Falls.

THURSDAY, 10 A M.

Third session of the Convention, at Convention Hall.

Reading of paper by H. D. Critchfield, general counsel, Cuyahoga and U. S. Telephone companies, Cleveland, Ohio. Subject, "Legislation and Litigation."

Discussion by Ed. Kibler of Newark Telephone Company, Newark, Ohio, and C. S. Bash, Home Telephone Company, Ft. Wayne, Ind.

Reading of paper by E. B. Fisher of Citizens' Telephone Company, Grand Rapids, Mich. Subject, "Bell Methods."

Discussion by George W. Beers of National Telegraph and Telephone Company, Ft. Wayne, Ind., and W. A. Bisbee of Georgia Telegraph and Telephone Company, Savannah, Ga.

Election of officers, and unfinished business.

THE SPECIAL TELEPHONE TRAIN.

All arrangements have been completed for the special telephone train, which will carry the western telephone men to the fifth annual convention, to be held in Buffalo, N. Y., on June 11-12-13, 1901. The train will leave Chicago, Monday, June 10, at 6 p. m., over the Lake Shore & Michigan Southern Railway. It will reach Elkhart, Ind., at 8:45 p. m., stopping for the Indiana and Michigan delegates. It will also stop at Toledo, Ohio, 11:50 p. m., for the Ohio delegation. These will be the only stops made by the train, which will arrive in Buffalo at 7:20 a. m. Tuesday, June 11, making the run from Chicago to Buffalo in thirteen hours and twenty minutes. The train proper will consist of Pullman sleeping cars, dining, buffet, library and smoking car, with a special Pullman sleeper for the ladies. The round trip rate is a fare and a dollar, which, from Chicago, is $14.50. The tickets are good for ten days. Those who desire can return from Buffalo to Cleveland by boat on these tickets. Those who are going to take this train should have their tickets read "over Lake Shore & Michigan Southern Railway" and make reservations by telegraph, telephone, mail or personal call, on Chambers, McMeal & Co., Manhattan building, Chicago, telephone Harrison 2951, publishers of TELEPHONY, or L. S. Vosburgh, city passenger and ticket agent Lake Shore & Michigan Southern Railway, 180 Clark street, Chicago, telephone Central 2683. The principal telephone manufacturers, supply houses, pole dealers and exchange men of the West have made reservations. As a matter of pride, this publication wants to show the eastern people that the West is still the Independent stronghold, and does everything well. To this end we ask the coöperation of those who are going to the convention from this section of the country, assuring them that this train is solely for their accommodation and comfort. We are devoting our best energies to the success of this train, without remuneration from any source, and will appreciate any help we receive.

INCEPTION OF THE TELEPHONE.

Telephone service has now become so universal that anything referring to the same is as a story thrice told. It does not follow, however, that an accident connected with its experimental stage will not be interesting to the general reader.

Something over a third of a century ago a gentleman doing business in one of the chief cities of Missouri required quick communication between his widely separated departments.

Messenger boys were all right, except when they chanced to run up against a dog fight, a runaway or a fire.

Our manufacturer was in a quandary, when one morning a long, lean, cadaverous specimen of the genus homo made his appearance and proposed to establish communication by a device of his own invention.

A bargain was soon struck, and in less than two days the manufacturer was enabled to dispense with messenger boys.

The device used was simply a crude telephone, and was the first practical exemplification, at least in Missouri, of the workings of the vast and perfect telephone system now in operation throughout the world.

Few men take advantage of the one opportunity of their lives, and as evidence of this fact neither the individual who constructed that crude telephone nor the one who paid for it are in danger of disgrace from dying rich.

GUIDED BY TELEPHONE.

An eastern man has invented some sort of device whereby steamers in a fog can be guided safely into harbor by means of telephone messages. Just how this is to be done isn't clear, but it is claimed that the invention is a complete success. If it is, we may expect that the befogged steamer captain will be advised by a cheerful voice to "Steer a little more to the right, please. Yes, hold that. Do you get me clearly? Yes, thank you. Little to the left. That's right. Steady. All well on board? That's nice. Slow down. Now to the right and steam ahead. Now five points to the left and go ahead at full speed. There you are. Slow down. Stop the engines and let her drift. Here you are at your dock. Don't mention it. Good-bye.

Let us hope that when the befogged captain halts his big ship outside the unseen harbor he will not be greeted with the tart rejoinder, "Lines busy," when he calls for advice and aid.

An important step in the popularization of the telephone, says a contemporary, has just been made in Glasgow, the first municipality in the country to set up a telephone exchange which will come into active competition with the National Telephone Company. The corporation system has been opened, and 4,800 subscribers are enabled to use municipal telephones in the commercial capital of Scotland. The Glasgow corporation telephone area covers 143 square miles, the lines extending to all districts surrounding the city. Accommodation in the central exchange has been provided for no fewer than 12,000 subscribers, and suburban exchanges will be established in due course. The system is notable in another respect than that of being a municipal one. It is an underground system, the conduits all running under the streets, and the wires are insulated with paper, a method which has the advantage of enabling a large number to be compressed into a small space.

Dr. J. F. Demers, secretary and treasurer of La Compagnie de Telephone de Bellechasse, of St. Octave de Metis, P. 2 Canada, informs this publication that he will attend the convention at Buffalo for the purpose of investigating and purchasing telephone apparatus.

With the next number of Telephony (July) the subscription price will be raised to one dollar per year. We believe our readers will agree with us that the publication is worth a dollar. Within six months we have received over five thousand subscriptions at fifty cents per year. We will see how many we receive within the next six months at a dollar. You can subscribe up to June 30 at the old rate of fifty cents, after which date no subscription will be accepted at this price.

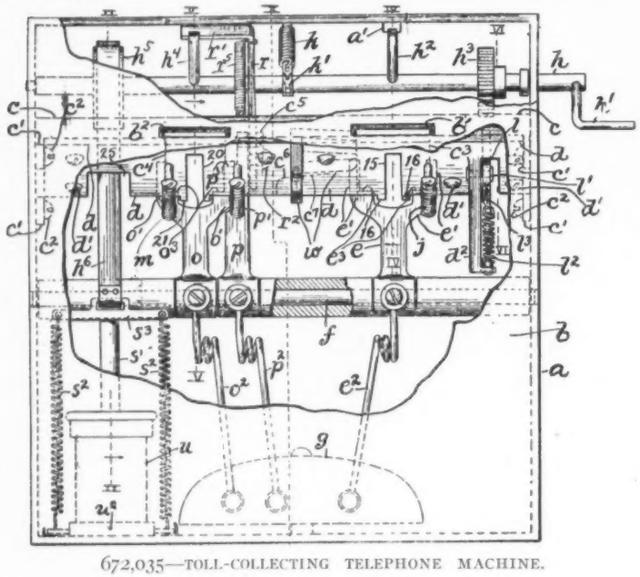
DIGEST OF TELEPHONE AND KINDRED PATENTS.

CONDUCTED BY EDWARD E. CLEMENT.

APRIL 16th, 1901.

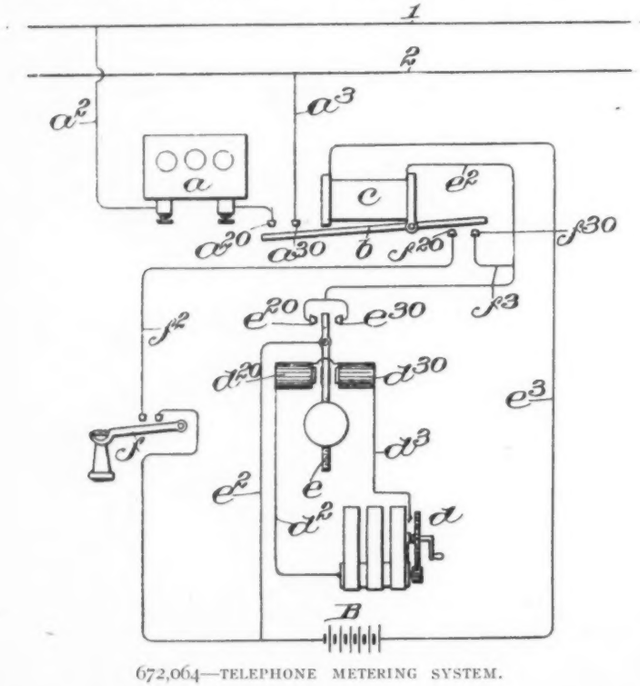
672,035—W. A. Foss. Toll Collecting Machine for Telephones.

This is a toll collecting device arranged to take coins of two denominations such as a dime and a nickel. The arrangement permits a single blow for one coin to be given on a gong inside the box, while the other coin permits two



672,035—TOLL-COLLECTING TELEPHONE MACHINE.

blows to be struck. The device is difficult of illustration, but the figure shows the salient features. There is a single gong, g, and the number of blows is regulated by giving one coin slot a single hammer, e^2, and the other coin slot



672,064—TELEPHONE METERING SYSTEM.

two hammers, o^2 and p^2. The hammer, e^2, is mounted on a swinging lever, e, which has two prongs, é and é, upon which the coin rests when it drops in the slot. (The figure is a plain view, looking down upon the apparatus.) When the coin is deposited the handle h′ is pulled down, and a lever h^8 passes through the slot 15 in its forward travel, and pushes the coin down, thereby pushing the lever, e, down, finally pushing the coin off the prongs and permitting a spring, j, to snap up the lever and hammer and strike the bell a blow. To produce a double blow the mechanism is more complicated. A swinging lever, o, with prongs and a hammer as well a retracting spring, similar to the lever, e, is provided, but one of the prongs overlies a pin, p^5, on a second lever, p, so that both levers are pushed down at once. The second lever is held by a latch, r, until the first one has swung back to strike its blow, and until the arm, h^4, has gone back to first position, where it trips the latch and permits the second blow to be struck. A spindle, h, carrying the handle has a ratchet mechanism, h^3, at one end whereby a full movement in either direction must be made before it can return; and a retarding device in the form of a dash pot at the other end retards its return and insures an interval between the two strokes.

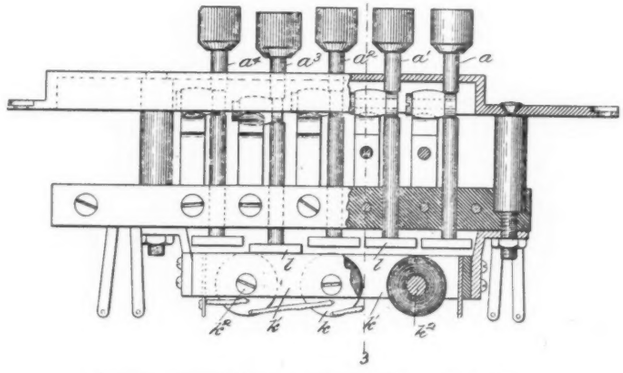
672,064—N. H. Holland. Telephone Metering System.

According to this invention, a meter, a, is adapted to be bridged across the line, by the action of signalling current, and to be subsequently operated from central when the desired connection is complete. In the figure, d, is a magneto generator which when operated throws alternating currents through the magnets, d20 and d30, to swing a pendulum, e, which closes the circuit from battery B to the magnets, c, and continues to hold it closed during recurring intervals while the pendulum swings. The magnet, c, pulls up its armature, which bridges across the contacts, f20 and f30, a20 and a30, thus bridging the meter, a, across the line 1-2, and also, if the receiver is then taken off the hook, including the magnet, c, in a circuit, e^3, e^2, f^2, B. When the conduction is complete at central a bridged battery is put on that operates the meter.

An adaptation of this system to lines where central energy is employed is also described.

672,122—W. W. Dean. Appliance for Telephone Switchboard.

This is an adaptation to telephone keys of a scheme often employed in the starting boxes of motors. It consists in holding the switch closed by an electromagnet in the main circuit, and releasing the same on the cessation of flow current. In the present case it is shown applied to ringing keys for selective signal common battery systems. Such keys are arrayed in groups, and here and there

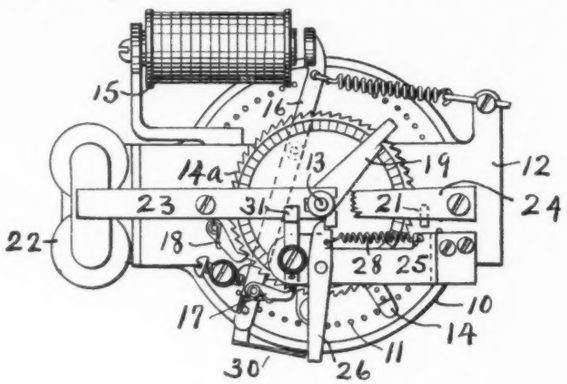


672,122—TELEPHONE SWITCHBOARD APPLIANCE.

are five, carried in a common frame and each provided with an iron foot, l, which extends across two bars, k′, forming the poles of a set of magnet coils, k, k^2. The connections to all the keys are such that a relay, not shown, is included in the plug tip conductor whenever any key is depressed. The back contact of the relay is in the circuit of magnets, k, k^2, and to the plug sleeve, so that these magnets normally receive current when the plug is in a jack. When the subscriber answers, however, the relay cuts off the magnets, and the key is released. By this means the subscriber's bell will ring until he answers.

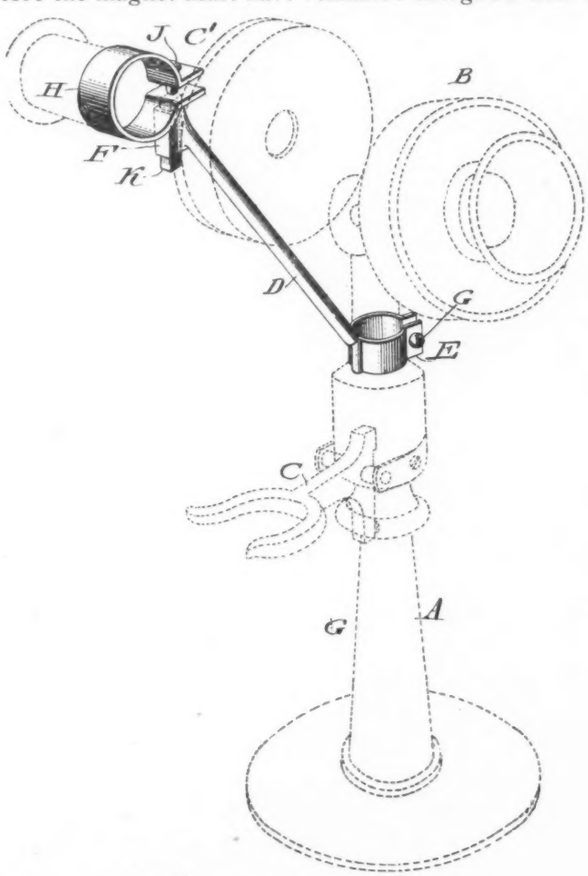
672,327—F. A. Lundquist. Switch for Telephone Exchanges.

This is a trip device for automatic switching mechanisms. 14a is a wheel having both edge and crown teeth. Magnet 15 stept the wheel around through part 17 acting on the edge teeth, detent 18 keeping the wheel from returning. Arm 19 is carried around by the crown teeth



672,327—SWITCH FOR TELEPHONE EXCHANGES.

engaging its bent over end. It is mounted fast on vertical spindle 13, which has some end play, and the magnet 22 lifts it from the crown teeth when energized. The spindle 13 has a spring to turn it to zero, and when the magnet 22 lifts, the arm and spindle are therefore returned. Heretofore the magnet must have remained energized until the



672,388—TELEPHONE RECEIVER HOLDER.

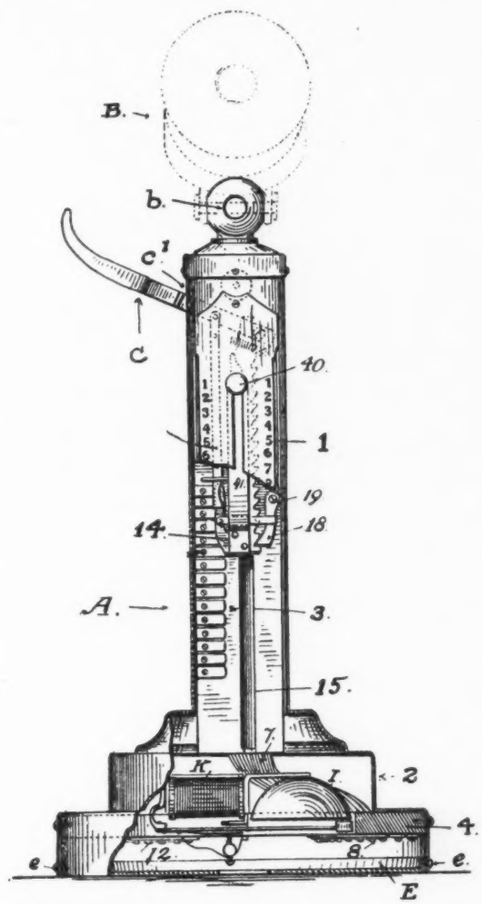
arm got all the way back, but in this case when the armature lever 23 is once tilted its tip rises over the end of a lever 26, a spring 28, pulls the end under, and lever 22 stays elevated until magnet 15 is again energized to start, when arm 30 strikes tail of lever 26, and tips the parts.

672,388—C. H. Newhall. Holder for Telephone Receivers.

This is an arm to clamp on a desk set and hold the receiver.

672,406—H. Herbstritt. Combined Desk Telephone and Switch Stand for Interconnecting Telephone Lines.

This is an intercommunicating desk set with its switch in the vertical column. The column is slotted, and handle 40 is moved down to carry the switch arm 14 (inside) over contacts 6, detent 18 catching in ratchet teeth on the slider



672,406—COMBINED DESK TELEPHONE AND SWITCH STAND.

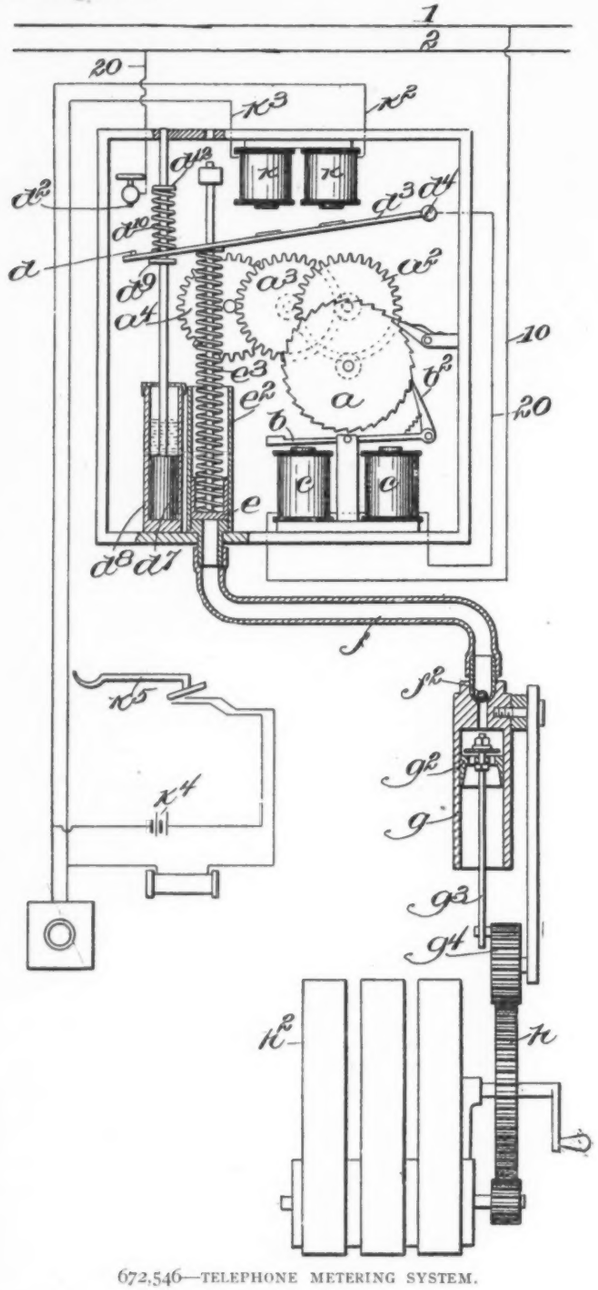
to retain it when set. When the receiver is hung up the arm 22 strikes a projecting finger on detent 18 and throws the latter out of engagement, permitting a spring drum at the top to draw the slider up to its initial position. The contacts are wired off to terminals in the base.

APRIL 23.

672,546—D. M. Bliss. Telephone Metering System.

This is really an arrangement of apparatus at subscribers' stations to be suitably affected by the current from a slowly driven generator at central, while lines are connected. The alterations or pulsations in current are supposed to be of too low frequency to effect the transmission of speech. As it is desirable that the record of a connection should be made only at the station originating the call, the patentee provides means for cutting in the meter at that station only. As shown in the figure this consists of a tube f connected at one end with an air pump g driven by the magneto, and at the other with a cylinder e containing a piston whose rod carries up a lever d^3 when the piston rises, thus closing contacts d, d^2 together and bridging magnet c-c of the meter across the line. Magnet K K is included in the local transmitter

battery circuit when the hook rises, and holds the lever d^5 up as long as the conversation lasts, a-a^5-a^5, etc., is the recording train.



672,546—TELEPHONE METERING SYSTEM.

672,621—C. C. Hughes. Telephone Transmitter.

This is a microphone of the multiple electrode type, with carbon balls. The balls are supported in annular grooves in the adjacent faces of the solid carbon electrodes. The rear electrode has a stem adjustment.

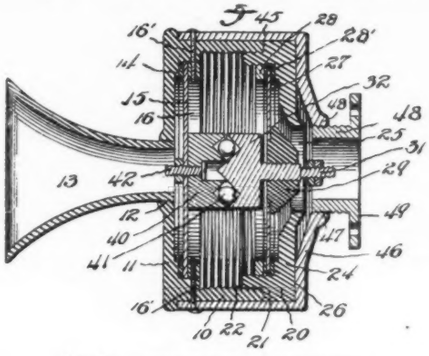
672,662—A. K. Andriano. Desk Telephone.

Another intercommunicator, having a polygonal base, with slots in several faces, and switch buttons working in the slots. Within the base are rows of contacts x, over which the switches F slide. Each switch has a finger sliding over a ratchet M (the teeth of which are turned the wrong way in the drawing, by a draftsman's error). A spring drum W is provided for each switch slider, and a vertically reciprocating pitman T is provided in the column of the stand, its head worked by a cam V on the switch lever, and its foot moving down the ratchet bar M when the receiver is hung up, whereby the switch sliders are all released and the spring drums W return them to zero.

APRIL 30.

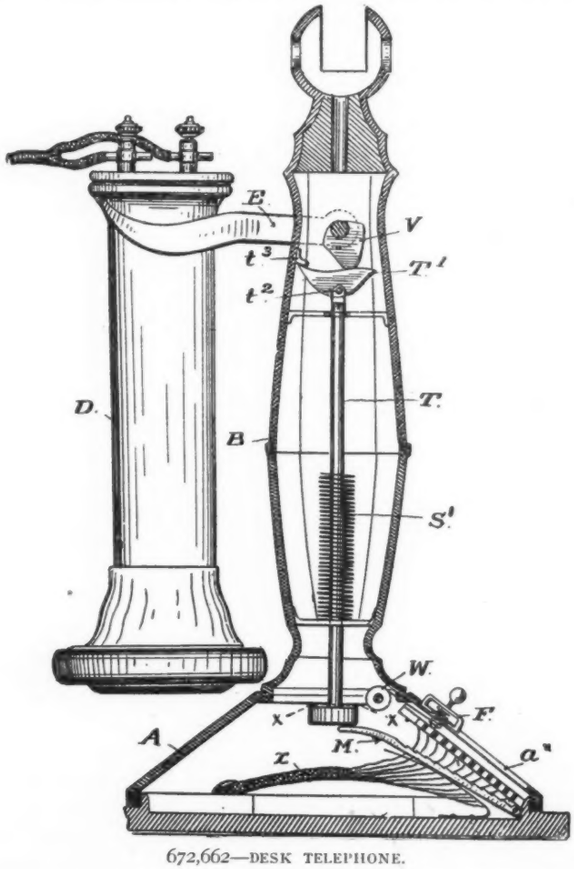
672,942—A. E. Keith and J. and C. J. Erickson. System of Automatic Telephone Exchange.

This is like most of the Lindquist, Keith and Erickson systems—incapable of clear condensed description. As an outline, merely, it may be stated that the present object is



672,621—TELEPHONE TRANSMITTER.

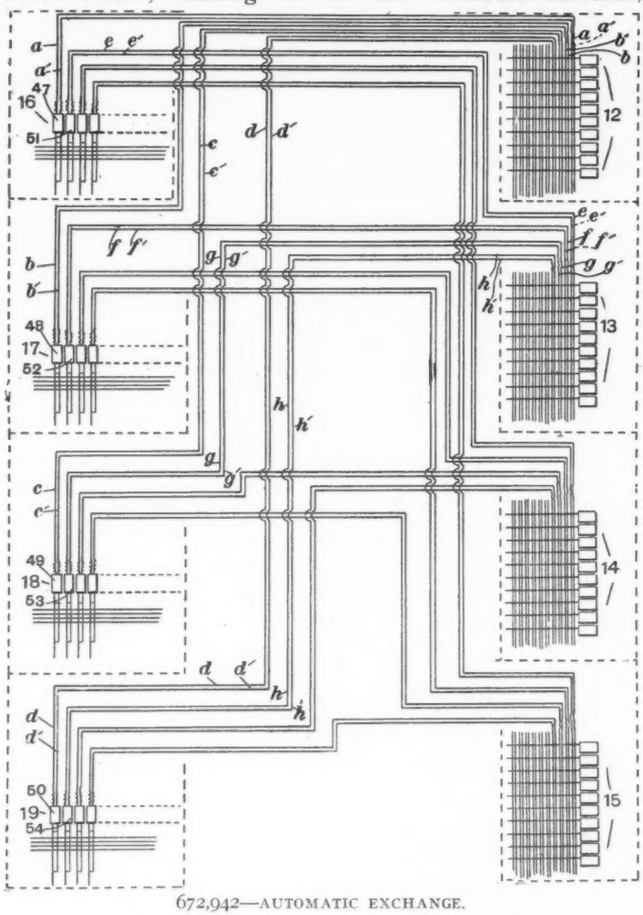
to simplify. Two separate and distinct sets of connecting machines are employed together, i. e., the "selectors" and the "connectors." The selector-switches correspond with the number of the telephone connected therewith. The function of each of the selector-switches is to connect with any one of a number of pairs of interconnecting wires run-



672,662—DESK TELEPHONE.

ning to the connector-switches. In the system described, for one thousand subscribers, the selector-switches select the hundreds and the connector-switches the tens and units. There are one hundred groups of selector-switches of ten switches in each group, which are connected direct to the

subscriber's line. In front of each group of ten selector-switches there are ten pairs of interconnecting wires. Each pair of interconnecting wires connects with one connector-switch, making in all ten connector-switches,

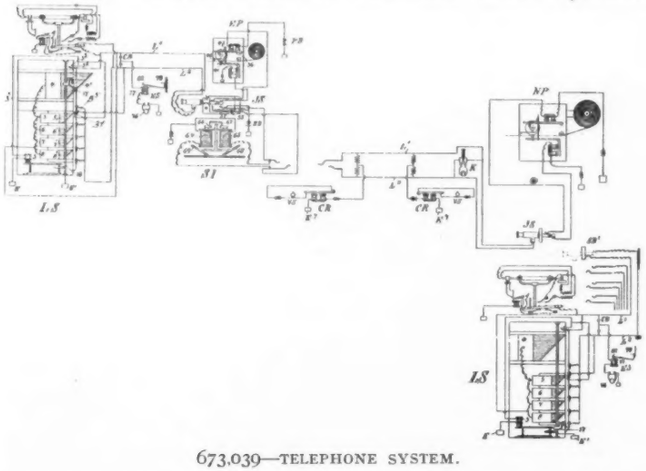


672,942—AUTOMATIC EXCHANGE.

through which any one of the ten selector-switches may make connections. There are one thousand connector-switches, divided into ten groups, of one hundred switches in each group, and through each of such groups one hundred subscribers may connect or be connected to.

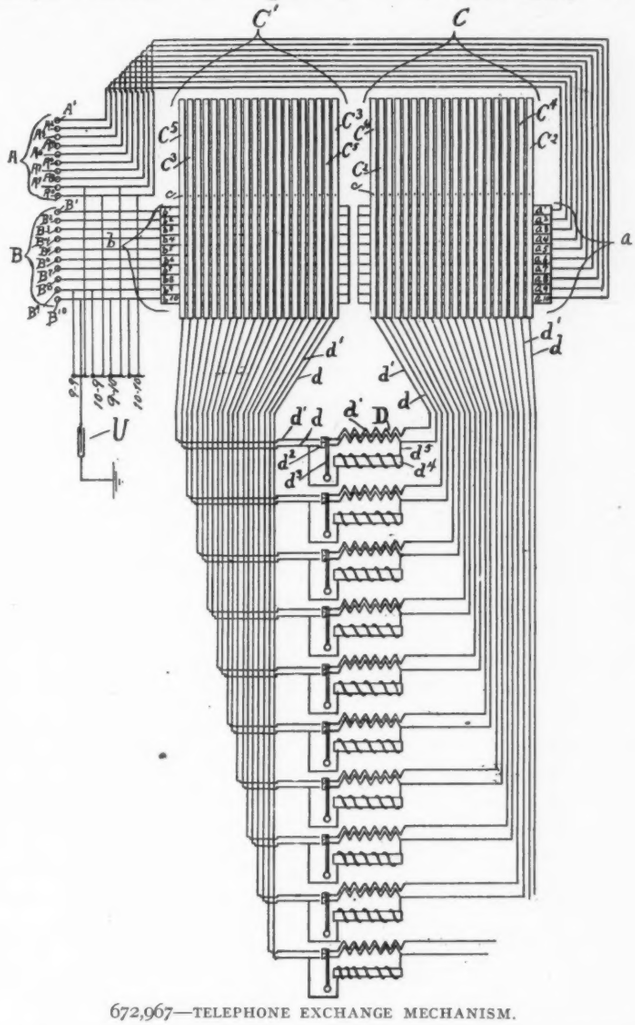
673,072—D. M. Bliss. Telephone Meter.

This is another form of Mr. Bliss' meter operated



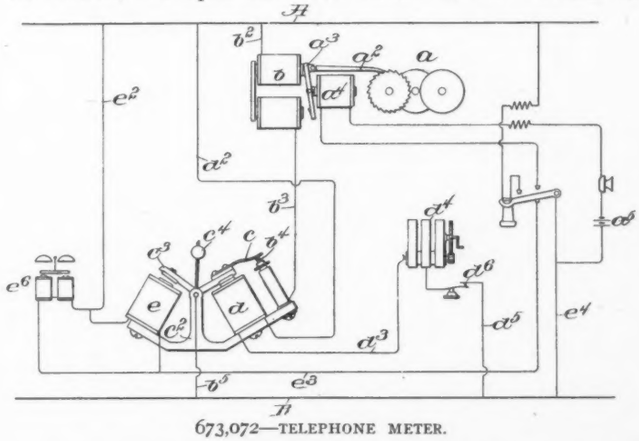
673,039—TELEPHONE SYSTEM.

by a slow alternating or pulsating current put on connected lines at central. The object in the present case is to disable the meter at the called station. In the figure a is the meter, whose magnet is included in a circuit b^2 b^3, from line wire A through contacts b^4 c^4 to line wire B. Two magnets, e and d, control the switch c, which has an overbalancing weight c^4, that holds the switch one way or the other when thrown past center. The magnet e is in parallel with the ringer, and has comparatively few ampere turns. The magnet d, on the other hand, is in



672,967—TELEPHONE EXCHANGE MECHANISM.

series with the magneto generator d^4, and has comparatively many ampere turns. When an incoming signal affects the ringer it likewise causes the magnet e to tilt the switch, and open the meter circuit at c-b^4. When the

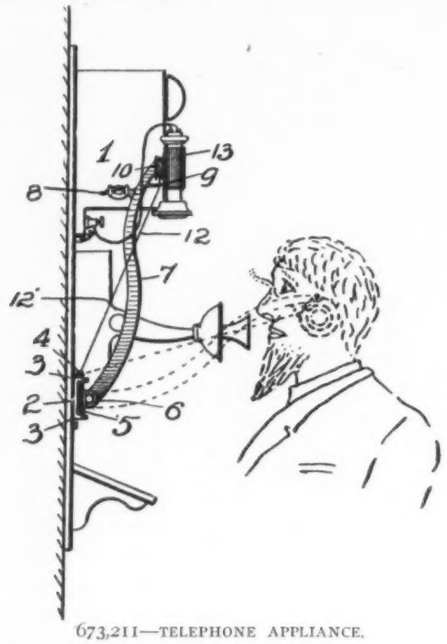


673,072—TELEPHONE METER.

magneto is used for an outgoing signal, the magnet d closes the contacts, even though some current goes through magnet e, as the latter is overbalanced by reason of its fewer turns.

673,211—M. Loudon. Telephone Appliance.

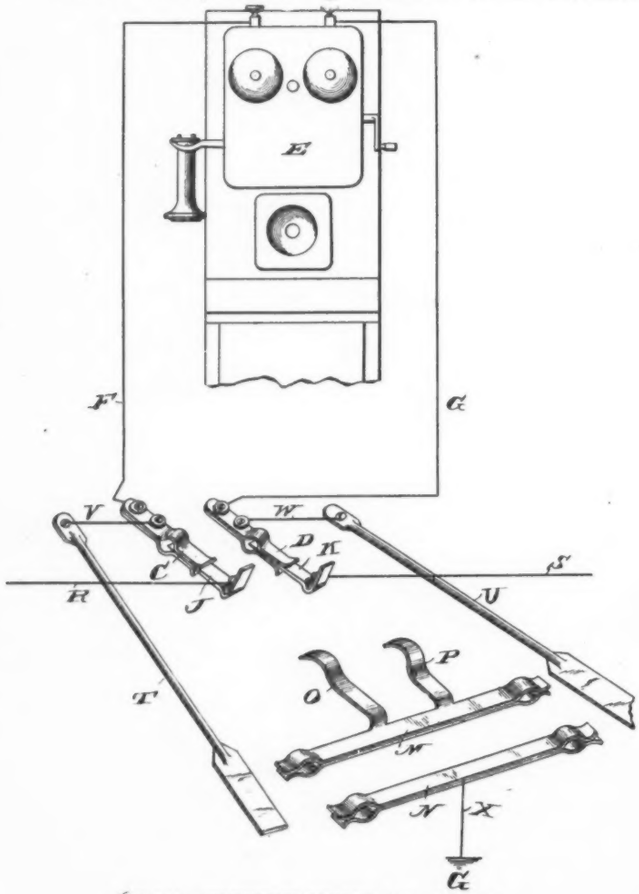
This is a pivoted arm to carry and hold the receiver, and having a figure 8 which depresses the switch-hook 10 when pushed up out of use.



673,211—TELEPHONE APPLIANCE.

672,967.—H. P. Snow. Telephone Exchange Mechanism.

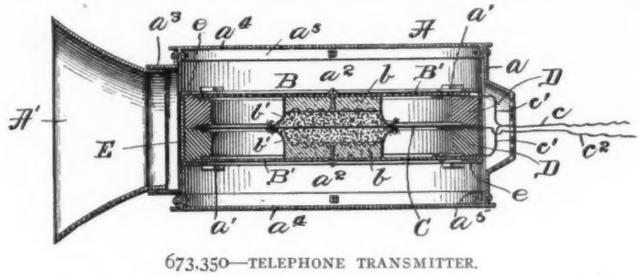
This is a very interesting extension of an invention



673,344—TELEPHONE SWITCH AND CUT-OUT.

patented in September, 1897, No. 590,633. In that case a central office system of connections was suggested, using combinations of a comparatively small number of connective circuit to work a comparatively large number of lines. The present case is a development of the mechanism and some improvements in the circuits. There are 120 claims in the patent, and an outline is all that can be given here.

In the figure two sets of bars are shown, a^1 to a^{10}, and b^1 to b^{10}, with overlying contact bars, C^2, C^4 and C^3, C^5, etc. The subscribers' lines are brought into the exchange as independent metallic circuits, and then connected across pairs of bars, each line going to one bar of the set a^1-a^{10}, and one bar of the set b^1-b^{10}. Thus, by making combinations of two bars many lines can be connected to few bars. The bars are



673,350—TELEPHONE TRANSMITTER.

thus busses, each forming a part of the same relative sides of a number of lines. How cross-talk is prevented is not very clearly explained, but mention is made of maintaining the balance of the lines by condensers U.

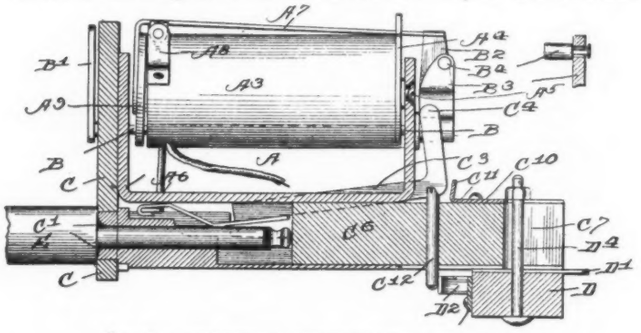
The connecting bars C, C^1, also in two sets, are connected in pairs. Each adjacent pair of connections is associated for talking purposes by means of a repeating coil D. Around one winding of the coil is a shunt d^5 with a signal magnet d^4, responsive to magneto currents for clearing out.

If it is desired to connect line 1-5, say, with 2-6, bars c^4 c^5, which are connected, are moved until their sliding contacts, not shown, rest on a^1 and b^5, respectively. That line circuit is then completed through coil d^1 of D. Bars C^2 C^3 are then moved to make contact on a^2 b^6, completing the other line circuit through the other side of coil D. The two lines are now inductively connected for conversation.

These operations are effected by a machine, controlled by push buttons and operated by a motor, which, on clearing out, restores the connecting bars.

673,039—A. T. M. Thompson. Telephone System and Apparatus Therefor.

This is a semi-automatic latent variable signal, self-indicating, non-interference telephone system, and the inventor is an Englishman. It combines many of the features



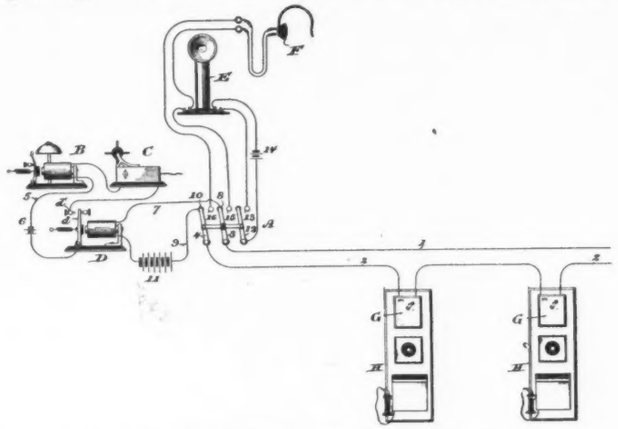
673,504—TELEPHONE SWITCHBOARD APPARATUS.

of the Herzog Teleseme dial systems now in use at many hotels to call for thirty odd wanted things, with printing telegraphs and telephone trunking apparatus. The principle is that of the subscriber setting numbers indicating all his wants before he gets central, and when central connects, the variable signal device is released and sends in the number wanted, which is received on a printing telegraph and the connections made without communicating with the subscriber orally. The apparatus is too complicated and has too many parts for detailed description. In the figure L S is the

subscribers' station apparatus, S I is his central office apparatus, and the rest of the figure shows the central office connecting circuits.

673,344—P. J. Wendell. Telephone Switch and Cut-out.

This is a switch for series lines, where any station may desire either to be cut out entirely, as for protection from lightning, or to be cut off from one side of line, and that side



673,794—ELECTRIC SIGNAL AND TELEPHONE SYSTEM.

left grounded, so as to be operative, while the cut-off station is connected in the other direction. The line is shown at R-S in the figure, which is so plain that the combinations possible can be read easily.

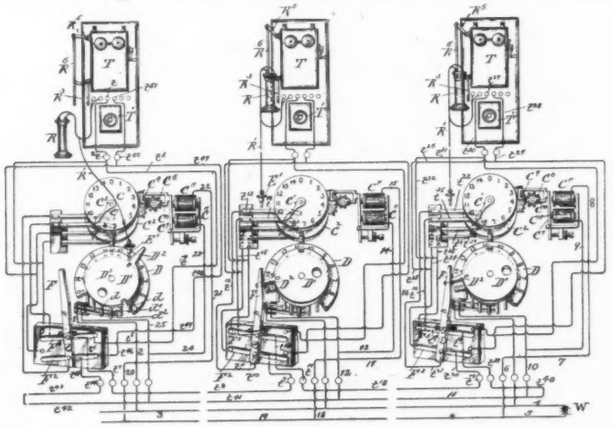
673,350—C. E. Yocom. Telephone Transmitter.

This is a granular transmitter having three diaphragms, one on each side and one in the middle, the two outer ones connected in one side of the local circuit and the middle one in the other.

MAY 7.

673,504—I. J. Kusel. Telephone Switchboard.

This is a mechanically self-restoring drop, and associated jack. The drop B^1 is fixed on a spindle B, which carries a dog B^2 at the rear end of the magnet A^2, beneath



673,796—TELEPHONE SERVICE APPARATUS.

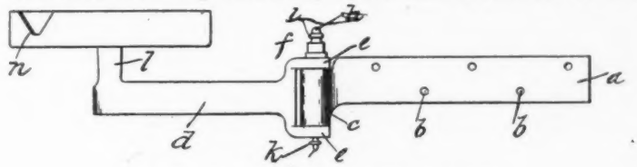
which lies a spring lever C^2, in position to be raised by a plug inserted in Jack C^1. The armature lever A^1 normally holds the dog, and hence the drop, in elevated position. When the lever A^1 is raised the drop spindle turns, and the dog B^2 falls, to be raised when the plug is inserted.

673,794—C. L. Fortier. Electric Signal and Telephone System.

The main object of this invention is to so combine a district telegraph and signal system with a telephone system that with a single electric circuit any one of a number of subscribers may call up a central station by means of signal transmitting mechanism designating at the central station the number of the subscriber and hold a conversation by telephone with an operator at the central station, the apparatus being so constructed and arranged that when the circuit is, in response to a call or signal, placed in condition for holding a telephonic communication between the central station and the sender of the signal or call the signal transmitting instruments and telephones of all other subscribers on the line will be rendered inoperative.

673,796—U. S. Jackson. Telephone Service Apparatus.

This is an intercommunicating system having clock trains at the individual stations, mechanically operated, but controlled from any station by makes and breaks to set one



34,482—TELEPHONE SUPPORTING BRACKET.

train to connect the desired station to line and lock out all of the others. The claims are specific, and the apparatus is too complicated to admit of detailed description in small compass. There are five sheets of drawings.

34,482—R. V. Griggs. Design for Telephone Supporting Bracket.

A bracket for a desk set, as shown.

TRADE NOTES.

Manufacturers are requested to send to this department such advertising matter as they may issue, which will be noted in these columns. Address same to Trade Note Department, Telephony.

MATHIAS KLEIN & SON report an unusually busy season. They will be pleased to send a copy of the "Red Book" upon application.

THE BROWNLEE LUMBER COMPANY, formerly of Detroit, Mich., is now located at Meridian, Miss., and reports a large sale of cross arms, etc.

MESSRS. E. M. VAN DUZEE JR., & CO., Guaranty building, Minneapolis, have recently made arrangements to represent the Haines & Noyes Company, Chicago.

FRED. M. LOCKE, Victor, N. Y., is manufacturing a No. 6 pony telephone insulator in brown or white, which is meeting with a very large sale, and giving universal satisfaction.

THE STANDARD CONSTRUCTION COMPANY, Chicago, will be pleased to send its catalogue No. 17 to any exchange company. A complete description of its apparatus is given.

W. N. MATTHEWS & BRO., Carlton building, St. Louis, have just issued a leaflet entitled "They have been boring in Texas and elsewhere," which will be of interest to all exchange people.

THE STANDARD TELEPHONE AND ELECTRIC COMPANY, Madison, Wis., reports a favorable increase in business. Its new eclipse switchboard is meeting with great success.

M. B. AUSTIN & CO., Chicago, have just published a very attractive pocket telephone supply catalogue. The company carries a very large line of supplies and construction material, and reports a fine trade.

THE INTERNATIONAL TELEPHONE MANUFACTURING COMPANY of Chicago is the name of a company just starting into the manufacturing of telephone apparatus. William E. McCormick, J. F. Dunlap and George H. Dunlap are the incorporators of the company.

THE INTERNATIONAL SPECIALTY COMPANY, Adrian, Mich., reports a large business in all kinds

of wood and metal work, and solicits correspondence from anyone interested. The company will be pleased to send its pamphlet entitled, "Dollars," illustrating the Schwarze telephone.

THE V. C. GRACE COMPANY, 155 Fifth avenue, Chicago, is manufacturers agent for a number of manufacturers in the telephone and allied fields. The company is pushing the sale of Queen & Co.'s apparatus.

THE ROLFE ELECTRIC COMPANY, 355 Wells street, Chicago, makes a very liberal offer, as will be seen in its advertisement appearing in this issue, in connection with a valuable book explaining the laws of electricity and rules of practice.

THE AMERICAN ELECTRIC FUSE COMPANY has moved its factory from Chicago to Adrian, Mich., where it has very largely increased facilities for turning out its product. The company has offices in New York, Chicago and San Francisco.

THE MONARCH TELEPHONE MANUFACTURING COMPANY is a new company starting in business in Chicago. John E. Norling, Ernest E. Yaxley and J. C. Hubacker are the prime movers in the new enterprise. It asks for a share of your patronage.

THE ELECTRIC APPLIANCE COMPANY, Chicago, is putting out a high grade bridging telephone, which is especially recommended for farmers' line work, where a low priced, but first-class instrument, is desired. Catalogue will be sent upon application.

THE VOUGHT & BERGER COMPANY of La Crosse, Wis., manufacturers of telephone apparatus, has moved into a new building and is installing new machinery for the manufacture of its product. The company invites correspondence from those contemplating the purchase of telephone equipment.

THE MALTBY LUMBER COMPANY of Bay City, Mich., recently suffered quite a loss in the fire at Detroit which wiped out the pole yard of the Western Union Telegraph Company. It had some 15,000 poles stored there and the telegraph company nearly 100,000. The company has numerous other yards, notably at Pinconning, Saganing and Boyne Falls, and the loss will not deter it to any large extent in making shipments. In fact, at the present writing it is loading one of the largest capacity pole boats on the lakes a second time for shipment to the burned yard and has chartered her for three more trips. In addition it is rushing forward all the cars possible and will soon have as large a stock as ever, and better assorted, as the old stock had run low on a few sizes.

THE AMERICAN TOLL TELEPHONE COMPANY has lately added to its already complete line of pay stations a new call register for measured service. The Bell companies have for years considered this part of their service very profitable, and these small instruments are in use in very large numbers. As yet the independent field has not had access to an instrument of this kind, but the above company has already taken large orders from independent exchanges. It is built on different lines than the register used by the Bell companies and cannot be manipulated in any way and it is impossible to obtain signals by rapping the box on the side.

Many telephone companies are now advertising measured service at the rate of 600 calls for 3 cents per call—all over and above that at 5 cents per call.

This call register notifies operator; also keeps an accurate account of all outgoing calls, thus saving all disputes between subscriber and central as the register is in plain view of subscriber.

This part of the telephone service is one that may be investigated by the independent companies with much profit to themselves and satisfaction to patrons.

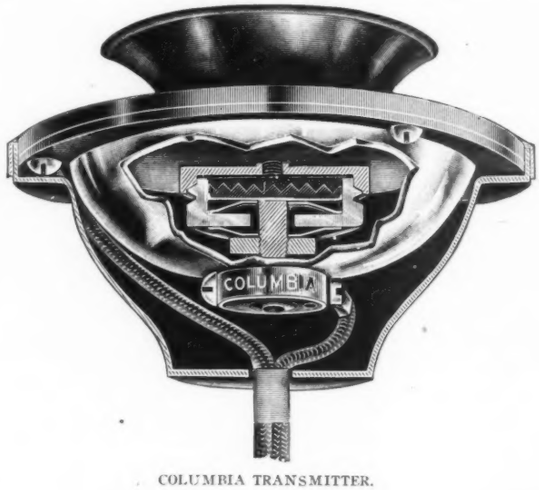
The instruments are sold at a very reasonable figure and can easily be attached to any telephone.

NEW TELEPHONE MANUFACTURING COMPANY

The Columbia Telephone Manufacturing Company, 194-204 South Clinton street, Chicago, is one of the latest companies to enter the independent telephone manufacturing field. The product of the company includes multiple exchange and toll line switchboards, telephones,

JAMES G. NOLAN.

magneto bells, transmitters, receivers, selective toll and party line systems and sundry other appliances for telephone service. Mr. James G. Nolan, whose portrait appears herewith is the engineer of the company and is the designer and patentee of the different pieces of telephone apparatus manufactured. Mr. Nolan is one of the pioneers in the telephone and electric field, graduating as an electrical engineer in 1882. He has been closely identified with both interests up to the present time. From 1883 to 1886 he was superintendent of the Toledo (Ohio) Brush



COLUMBIA TRANSMITTER.

Electric Light and Power Company, during which time he invented carbon brushes for dynamos and motors. During 1887-88 he was traveling engineer for the Central Thomson-Houston Electric Company of Cincinnati. In 1889 Mr. Nolan entered into the manufacture of incandescent lamps with the Jewell Incandescent Lamp Company at Chicago. After which he entered the telephone manufacturing field as traveling salesman for the Western Telephone Construction Company, remaining with this company until 1899. During 1900 he designed the apparatus for the Century Telephone Company of Chicago.

The apparatus of the Columbia Telephone Manufacturing Company is claimed to possess many points of excellence and the transmitter and receiver illustrated here are constructed on entirely new lines. Prospective purchasers of telephone apparatus will be sent descriptive matter and prices of the company's full line of apparatus upon request.

COLUMBIA RECEIVER.

A NEW PARTY LINE SYSTEM.

A selective signalling and locking-out device for party line telephone was recently exhibited in Chicago, and will be shown at the convention at Buffalo, that has many novel features and if it is as successful in actual practice as it was in the exhibition given at the Grand Pacific Hotel its practicability is assured. There seems no reason why the system should not be a practical success. It is claimed to be simple in construction, not expensive and does not require expensive changes at the central office.

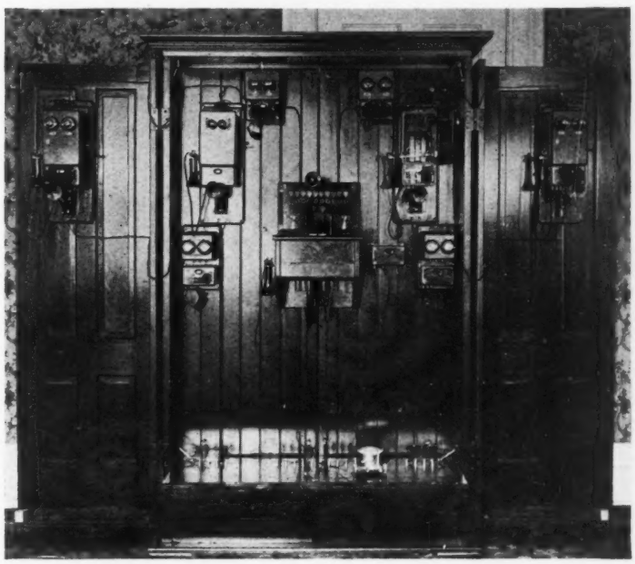
The system is almost wholly automatic in its action; requires no material change and no extra space on the switchboard; is operated over a single circuit, either metallic or grounded, and any number of telephones, that it is practicable to put on one line may be equipped with their system. The device used at the telephone is attached to the bottom of the generator box, as shown in the cut, and occupies a space of about 2x3x6 inches. It is gotten up in a neat manner and is not at all unsightly. A very little change in wiring is all that is required at the telephone and the device can be attached to any of the standard makes. The directions to the subscriber are: "To signal central, remove receiver, press button and ring" and every instrument on that line is locked automatically and a busy signal displayed. Central plugs in as usual, gets the necessary instructions and in signalling the called subscriber locks all the instruments on that line except the one signalled. When the conversation is finished, removing the plugs restores each line to its normal condition.

Mr. W. H. Preece, the head of the English postal telegraph system, says in "A Manual of Telephony:" The conditions required for a "selective signal" system are:

1. The exchange operator must be able to call any required subscriber on the party line without disturbing any other.

2. Each subscriber must be able to call the exchange without disturbing any other.

3. It must be impossible for any subscriber on the line to overhear or intercept a conversation in which they are not engaged.



A NEW PARTY LINE SYSTEM.

4. Subscribers of a party line must be able to intercommunicate either with or without assistance from the exchange (preferably without).

In a recent article on party lines by Mr. A. E. Dobbs, the statement is made that an instrument adapted for this class of work should contain the following points:

1. It should be selective signalling, so that any subscriber could be called without disturbing the other.

2. It should not require the use of more than two wires.

3. If possible, one instrument in use should lock out all the rest.

4. It should be able to take care of ten instruments or signalling station.

5. It should be a step-by-step system. Strength and polarity systems are only reliable for a small number of signals.

6. Its cost should not be greatly in excess of those in common use.

7. It should keep clear of existing patents.

8. It should be reliable at all times and in all conditions of weather.

It is said that this device fulfills all the requirements for a successful selective signalling anl locking-out system, as laid down by the gentlemen quoted above.

The system is the invention of Messrs. F. E. Mayberry and W. M. Holmes of West Medford, Mass.

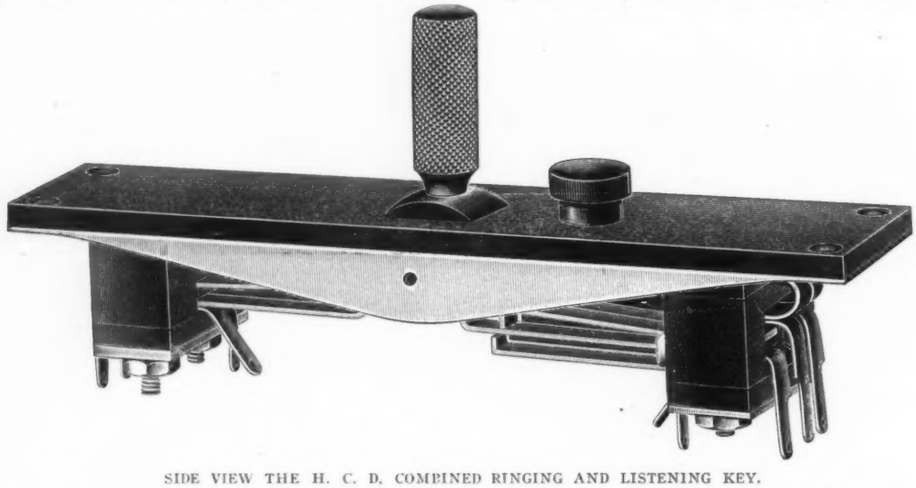
WILLIAMS-ABBOTT APPARATUS.

The Williams-Abbott Electric Company's standard metallic circuit switchboard, employing the H. C. D. combined removable spring-jack, drop and coil, shown in the accompanying cuts, is the invention of Mr. H. C. Dodge, the general manager of the company.

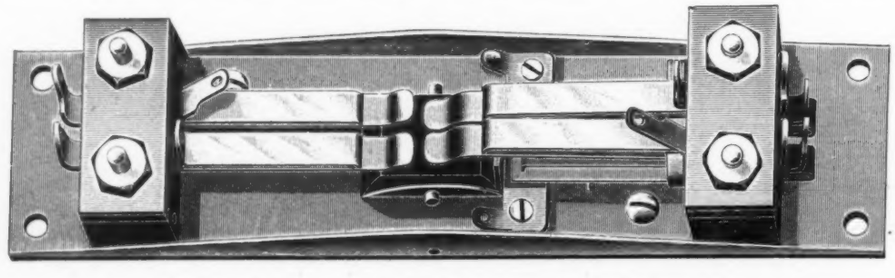
L. SANDS, PRESIDENT WILLIAMS-ABBOTT ELECTRIC COMPANY.

The company is about to place on the market this new local exchange and combined exchange and toll line switchboard, embracing new and original improvements, employing a self-contained combined removable spring-jack, drop and coil; shutter automatically, mechanically restored upon insertion of plug into jack; tubular, highly sensitive, non-induction line and clear-out drops. A new ringing and listening key, etc.

This board is for use alike as a city exchange and toll line board. Line and clear-out drops of tubular form non-inductive and highly sensitive. The tube containing the coils allows of insertion of coils wound either for series or bridged work. Is free from cross talk and inherent defects allowing of induction disturbances. Being of metallic circuit type, is adapted for connection of common return wire or grounded circuits as well as complete metallic circuits or a combination of the three. Each line drop, jack and coil is self-contained and separately removable from the cabinet without disturbing soldered connections. The shutter is automatically, mechanically restored upon insertion of plug into jack. There is also provided mechanical means whereby a drop, which is displaying a signal while the switchboard plug is in the spring-jack associated with said plug, may be automatically restored to its normal position upon withdrawal of said plug, which will be employed in connection with toll line switchboards where clear-out drops are not used. This switchboard is adapted for use in exchanges up to several hundred numbers. Each operator's position contains 100 self-restoring drops, 10 pair of cords and plugs, and 10 combined listening and ringing keys. The transfer system to be employed is a departure from the systems usually furnished. In an exchange of 2,000 numbers only 12 transfer plugs are required at any one position. The transfer jacks are most conveniently located. A luminous signal directs the operator with speed and certainty. Three plugs only are used in a transfer call. The first operator only receives the clear-out signal and the signal is displayed on the board of the second operator the instant the first operator withdraws her plug from the transfer jack. The board can be equipped with bridging drops for bridged lines, and series drops for local lines: triple-jack bridging of series drop for a way station on through lines; triple-jack ringer annunciator both series and bridging for special signaling at a way station on through lines and single jack ringer annunciators for toll lines. All required combinations to meet demands of perfect service are met by means for instance, of the triple-jack on the drops and ringer annunciator for use on through lines. The following combina-



SIDE VIEW THE H. C. D. COMBINED RINGING AND LISTENING KEY.



BOTTOM VIEW H. C. D. COMBINED RINGING AND LISTENING KEY.

tion at the point at which same are inserted, can be made; i. e., the operator can plug into jack to bridge her set in onto the circuit to listen after she has ascertained as to which section call has come in on; can plug into that section with a switchboard plug and complete the connection wanted. The act of plugging in on the section over which call is sent cuts off the other end or section, and leaves it in circuit with the drop.

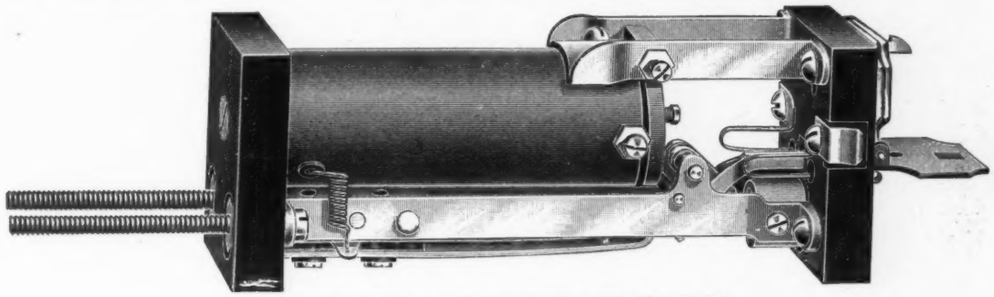
The repeating coil key furnished is a very valuable feature for toll line work, and for connection of ground and common return lines with metallic circuits. The repeating coil can be cut either in, or out of circuit. The calling and answering subscriber may each be called separately without changing plugs, and the operator can cut her set in or out of circuit.

The listening and ringing key is similar to the repeating coil key in general appearance, and by means of it the operator can cut in her set, or ring each subscriber connected by the pair of connected cords and plugs, separately, and at will.

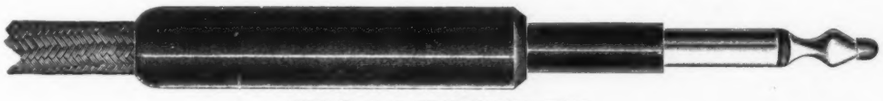
In dimension the 100 number cabinet is as follows: Height from floor to top is 5 feet and 6 inches. From floor to keyboard 3 feet. Face space for 100 combined drops and jacks is 15 inches square. A reserve space is provided over the drop space, 5 inches in height by 17 inches wide by 9 inches deep for mounting repeating coils and auxiliary apparatus.

Blue prints showing circuits of the board and complete specifications for wiring, material, arrester and distributing boards, cable terminals and junction box arresters calling for an ideal central station equipment will be furnished to all prospective buyers upon request.

The box is also provided with a compound polarized ringer, with loud four-inch gongs, so that an officer may be called to any of the patrol boxes from the central office at any time, or, in case of an urgent order to the entire police force, all the recall bells can be rung and the order given to all the police on the grounds in an instant. This feature is entirely new and is one of the most important features in a police system, especially in case of a robbery, murder, etc., as the entire police and detective force can be given by telephone a full description of the suspects at an instance. A patrol box is placed at each of the gates in all the principal buildings and throughout the grounds.



SIDE VIEW THE H. C. D. COMBINED DROP AND JACK.



THE H. C. D. SWITCHBOARD PLUG.

THE PAN-AMERICAN EXPOSITION POLICE PROTECTION.

The Pan-American Exposition grounds, it is said, will be protected by one of the best disciplined detective services and police departments ever organized, and is being provided with the latest and most complete police signal and telephone systems on the market. The system used is the Cregier system, put on the market by the Municipal Signal Company, Chicago. The grounds will be divided into three districts, with a police station with central office switchboard in the center of each district, and the districts will be connected with each other and also with the telephone system used on the grounds. From any of the patrol boxes a regular reporting signal can be given, and the report given by telephone to the district station or direct to police headquarters. The patrol boxes are so constructed that a separate and distinct signal can conveniently be given for an emergency or wagon call. The box is provided with an iron-encased extension bell, so that when an emergency call is given the central office attendant can ring back to indicate that the wagon call is being answered.

CITIZENS' TELEPHONE COMPANY OF RACINE.

The Citizens Telephone Company of Racine, Wis., is now an absolute fact and giving service to its patrons. This company was organized of local citizens there being upward of four hundred of the most prominent business men identified with it as stockholders. This, in itself insures the popularity and success of the enterprise.

The officers of this company are, John B. Simmons, president; E. B. Belden, vice-president; J. C. Breese, secretary; C. R. Carpenter, treasurer and Will Van Middlesworth, general manager.

The plant was constructed by the well-known contracting firm of Jones & Winter of Chicago. In its construction, nothing was spared to make the plant permanent, substantial and first-class in every detail. The main portion of the outside construction is underground work and the service is full metallic.

The exchange equipment, terminals, apparatus and telephones was furnished by the Sterling Electric Company of Lafayette, Indiana. One of the novel features in connection with this exchange is their prompt care and attention of country subscribers in connection with their city exchange.

The patrons commenced to receive service some time since, there being seven hundred connected up on the opening day. Their remote residence districts and farmer's subscribers are cared for by the use of the Sterling Electric Company's selective signal non-interfering party line telephones, enabling them to serve four and eight subscribers upon one metallic circuit. This apparatus has proved quite an advantage to the company, in enabling them to rapidly reach the outlying districts at a nominal expense. It is fully expected before the close of the year that there will be fifteen hundred subscribers in service at this popular exchange.

Monmouth, Illinois, has one of the best constructed and equipped telephone exchanges in the Independent field. This exchange was installed and constructed by the well-known telephone contractors, Jones & Winter of Chicago, Illinois, and they have not spared expense in making it a model plant. There are miles of underground conduit, all wires are cabled that will admit of the same.

A VIEW OF CORPORATIONS FROM THE STANDPOINT OF THE STOCKHOLDER.

BY GRANT NEWELL.

Article VI.

The purpose of this article is to further consider the liability of telephone corporations for injuries done by them to the property of others. In so doing we are met at the outset by the necessity of distinguishing between the two great classes of property,—real and personal; for injuries may be committed to one without affecting the other. Again, it ofttimes happens that an injury committed results in damage to both the realty and the personality of the injured party. For example, a company in setting its poles upon the land of a person without license from the owner commits an injury to the real estate, and, if in so doing, crops which have been severed and placed upon the ground for the removal are destroyed, an injury results to the personal property also. Then, too, in committing an injury as above outlined damage may accrue to two different persons, for the owner of the land may have let it to a tenant to whom the crop thereupon would then belong.

It is a principle of law long established that the owner of land owns upward and downward indefinitely from the surface of the soil. So, if a company string its wires over a man's land without license, even though they do not touch the land itself, or anything thereon, it is guilty of a trespass, and may be compelled to respond in damages therefor. It may suggest itself to some that in a case of the kind last cited the amount of the damage provable would be so small as to preclude an action. But, the law affords the remedy without taking into consideration the question of the amount of damage. Indeed, wherever one can show that a trespass has been committed, the law will imply at least nominal damages, and thus permit the action to be maintained. It will hardly suffice, therefore, for a telephone company to set a pole upon, or to string wires over land, without first obtaining authority so to do. Such authority is obtained in every instance in one of two ways, either by direct agreement with the owner of the land, or through proper proceedings in court under statutes providing for the exercise of the right of eminent domain. In each of these proceedings it will be observed that damages are presumed to result to the owner by reason of the use made of his land. Under the first method such damages are computed and settled by the parties themselves; in the second they are assessed by a jury under the direction of the court. Our subject, then, naturally divides itself under two heads: (1) damages unlawfully inflicted; and (2) damages for which compensation must be made, though the injury were committed in the exercise of a lawful authority. First, then, concerning damages unlawfully inflicted. In the first place, mere speculation as to what the courts might or might not do in a given case is of little avail when we have at hand decisions of the courts touching the most important of the questions which may properly arise. It should be borne in mind that the grant of a franchise, or license, to run the line over the land of an owner carries with it the right only to construct such line in a manner to cause the least damage to the owner consistent with proper construction. And, further, that in carrying a line along and upon a highway no unnecessary damage should be inflicted upon the property of adjacent landowners. Upon this proposition the court of last resort in the state of Louisiana decided that any unnecessary injury to trees upon the lands of adjacent owners would give such owners actions for damages. See Tissot vs. Great Southern Telephone, etc., Co., 39 La. An. 996. In this case a telephone company cut a hole twenty-five feet in circumference through the limbs and foliage of the trees for the purpose of stringing its wires, and the courts held that this was an unnecessary injury to the trees, and intimated that the company should have placed its poles on the other side of the highway, where there were no trees. But this decision is evidently open to criticism, for whether a hole twenty-five feet in diameter would be necessary to proper construction would obviously depend upon the number of wires necessary to be strung therethrough, and whether such number was authorized by the terms of the grant, or franchise. It is clear, however, that where such cutting of trees is not necessary the company is liable, and it was so held in Memphis Bell Telephone Co. vs. Hunt, reported in 16 Lea (Tennessee) at page 456. And again in Illinois, in the case of W. U. Tel. Co. vs. Scatterfield (34 Ill. App. 386), it was held that where the damage was done merely as a matter of convenience to the company, and was not necessary to the proper construction of the line, the land owner could recover damages. We are here met by that conflict of laws which arises from the fact inherent in our system of government that each state may legislate upon its internal affairs as it sees fit. Thus we find that in many states the matter of injury to property adjacent to the highway by telegraph and telephone companies, is regulated by statutory provisions. It is apprehended that these rules of law would be applicable to injuries done to any sort of property, as well as to the case of trees. So, if a wire be attached to a building without the consent of the owner, and cause damage to the premises, the company which placed it there will be liable therefor. So decided in Gray vs. Boston Light Co. (114 Mass. 149.) Again, if the company in the operation of its business discontinue the use of certain wires, it should within reasonable time remove the same, and failing to do so it will be liable for damages caused by their existence. The franchise implies at least, that the wires authorized to be strung are to be used, and when not so used the company as to them, is no longer protected by the grant. See in this connection Jackson vs. Wis. Telephone Co. 88 Wis. 243. Passing now to those injuries inflicted while the company is exercising the rights given it under its franchise, or grant, in a lawful manner, we find that the questions herein involved center about the doctrine of eminent domain. It has already been stated in these articles that the right of way which is granted to telephone poles is subordinate to the uses of the highway for public travel, and that the poles must be so placed, therefore, as not to materially incommode the public in the use of the highway for the purpose for which it was originally designed. These articles being written for the readers of TELEPHONY, the writer is pleased to note every criticism, or inquiry, made in reference thereto. In a very recent communication from Galena, Kansas, a question is raised as to the relative rights of telephone and electric railway companies occupying the same street or highway. The answer to this inquiry falls within the province of this article. We will assume that the telephone company had the prior occupancy of the street, and that the operation of the electric railway, while properly carried on, results in damage to the telephone service. In very many cases and by the great weight of authority, it has been held that the telephone company should make the necessary changes in its system to obviate the difficulty, it appearing that this may be done in at least three different ways. This ruling is based upon the ground that telephone poles and construction impose an additional servitude upon the highway, which is primarily for travel, while its use by the electric railway does not do so. See Taggert, vs. Newport Street Railway 16 R. I. 668. Board of Trade Telegraph Co. vs. Barnett. 107 Ill. 507; and Blashfield vs. Empire State Tel. & Telp. Co. 18 N. Y. Sup. 250. To these might be added, did space permit, an almost indefinite number of decisions. Following the early case of Hudson River Tel. Co. vs. Watervliet Turnpike and Ry. Co., decided in 135 N. Y. page 393, the court of Pennsylvania, Ohio, Utah, Tennessee, Wisconsin, and the Federal courts,

have decided that the rights of telegraph and telephone companies are subordinate in the respects above indicated to those of electric street railways, for the reasons advanced above. This would seem to definitely settle the controversy, and the more so because the writer in his research has been unable to find any case holding directly to the contrary; and for the further reason that the rule is apparently founded upon correct principles of law and strong common sense. In concluding this article, digression will be made in an attempt to answer a query presented to the writer concerning the right of a telephone company to make a direct charge to persons, not subscribers, who use the instruments of subscribers for their own purposes. The solution of this question undoubtedly rests upon the nature of the contract existing between the company and its subscriber. Upon this point no information has been given. In a general way it may be said that if the instrument is furnished for private use only, and the subscriber permits outsiders to use it, he is undoubtedly alone liable for such use. But, on the other hand, if it be understood between the company and the subscriber that outsiders, as well as the subscriber, are to make use of the facilities afforded, and the user with such understanding takes advantage of such facilities for his own benefit, he is undoubtedly liable directly to the company for the service rendered. Some more particular information as to the nature of the contract must be afforded if a more definite opinion be desired. Our next article will extend the discussion of injuries to property rights, when inflicted by companies of the nature we are considering.

A PROMINENT TELEPHONE MAN.

Among the men who have been prominently connected with the Independent telephone movement from the beginning, Henry Shafer, whose portrait is shown below, is one of the foremost and a brief sketch may be of interest.

While in his modest way he usually avoids being personally mentioned or known in matters for which his energy and labor are responsible, preferring to give all credit and advertising, if any, to the company with which he is connected, it may be said, however, that his deep thought and study and his far-sightedness in business principles has been a marked factor in the Independent telephone field.

For five years previous to his entering the Independent field he had held various positions in the supply and purchasing departments and general offices of the Chicago Telephone Company. While in these positions he took advantage of the opportunity of becoming familiar with all the systems and equipment of the Bell companies, from their first, much of which was in use at that time or was stored away in the supply house, to their very latest apparatus. In the positions he held be became thoroughly versed in the methods of handling the enormous amount of business and the accounts in one of the largest telephone exchanges in this country. For several years he had full charge of the purchasing reports, and checking all invoices gave him a full knowledge of all material and apparatus used and their prices. Foreseeing or believing there would be a larger opportunity in the Independent business then with the company he had so long been employed in, he resigned his position when the Stromberg-Carlson Telephone Manufacturing Company was organized and was one of the first to become actively and financially interested. He has been closely connected with this company since its organization, through its first several years of hard struggling, and for the past several years has been its manager. There probably has been no harder worker in the field than he, working from early until late, doing his regular routine work during the day and practically all the advertising, circular work, etc., evenings.

The Independent Telephone, which many still have in their files of electrical papers, he edited and arranged entirely outside of regular office hours and in connection with the regular advertising work of the company. It may be said that The Independent Telephone was one of the most complete, the cleanest and best edited journals written in the interest of a manufacturing company that was ever published. It no doubt was one of the great means of bringing to the front the company and the central energy system. To him is the credit of first using the term "central energy" in connection with systems having a common battery and all ringing energy at the central office.

Mr. Shafer is also connected with, and secretary of the Municipal Signal Company of Chicago, which is placing on the market the Cregier police system, a new direct line signal and telephone system for city police service.

HENRY SHAFER.

He has for the past few months given a large part of his time to the interests of the Continental Telephone Construction Company, of which he is secretary and treasurer, which is building a 1,000-line capacity 500 equipped plant at Streator, Ill., and surrounding territory. It is quite certain that the plants being built by the company under his direction will be of the very best as has been all work in the past done by him or under his control. While always "one of the boys" as far as his health will permit when in a social gathering, he is, however, always on the alert and well guards the interests he represents.

His affability and his straight and square dealings have made him many friends in the telephone field.

Mr. Shafer has always opposed a combination of the Independent telephone manufacturers, believing that such a condition would be detrimental not only to their best interests, but to the exchange companies as well, which was clearly shown in his advertising and correspondence, and his editorial in The Independent Telephone on "Who Should Standardize Independent Telephones" during the time the consolidation of manufacturers was in contemplation.

DECISIONS AFFECTING TELEPHONY.

PREPARED FOR TELEPHONY BY ANDREWS & MURDOCH, BERRIEN SPRINGS, MICHIGAN.

DAMAGES FOR REMOVAL OF PHONE.

H. H. Ashley, a livery stable keeper in Helena, Montana, entered into a contract with the Rocky Mountain Bell Telephone Company for the use of a phone at his place of business, rent payable by the quarter in advance, on the first day of each quarter. Among other things, the contract provided: "Upon nonpayment of any sum due, * * * the lessor may terminate the lessee's right immediately by written notice mailed to or left at the aforesaid premises and sever his connection and remove the instruments." It appears also that the rental was payable upon demand, and, further, that the terms of the contract could not be varied or waived by any representations or promises of any canvasser or other person, unless the same was in writing, and signed by the general manager of the defendant company. Upon the day the third quarters' rent was due, the collector of the defendant demanded of the plaintiff the sum of $16.00, rent, which, on account of the fact that the plaintiff did not happen to have his check book with him at the moment, was not paid; but upon the suggestion of the said collector the payment thereof was deferred until the following Monday morning, at which time the plaintiff handed the full sum of $16.00, due as aforesaid, to the superintendent and manager of the defendant company. This money was then and there refused, and returned to the plaintiff with the statement on the part of the superintendent that the contract of rental and use of the said telephone had been by him, in writing, declared terminated, and the telephone removed, on account of default in the payment of the sum due on the first of the quarter, and that said notice in writing had been served by leaving it upon the premises of the plaintiff where the telephone had been in use; the contract providing for such termination, and for such service of notice. Plaintiff alleged that the defendant's telephone system was the only one in the city of Helena, where he was doing business. He sued for $1,900 damages, alleged to have been sustained by him through the falling off of his business at his livery stable, where the telephone instrument had been established under said contract. The defendant offered to prove in mitigation of damages that it offered to replace the phone after it was taken out provided Ashley would pay to it the sum of $15.00, the cost of connecting and installing the instrument. This defense the trial court refused to permit to be made and judgment was entered in favor of Ashley for $500.00.

In reviewing the action of the trial court the Supreme Court held that it was error to refuse the defendant's request for the following instruction: "If the jury believe from the evidence that defendant's collector demanded of the plaintiff payment of the money due for such telephone service, and such payment was not then made, then the defendant had the right to terminate said contract; and this is so even if such collector informed the plaintiff that he might make such payment at some subsequent time, unless the jury further believe from the evidence that the representation or promise of such collector, if any, was in writing, and signed by the general manager of the defendant's company."

The Court also held that it was error in the trial court to exclude the testimony of defendant concerning its offer to restore the instrument upon payment by plaintiff of $15.00 costs of making connections, as it was the duty of Ashley to do everything in his power to decrease the damages and the testimony was admissible in mitigation of damages.

GAS EXPLOSIONS IN SUBWAYS.

Mary C. Chalmers was injured by the explosion of gas escaping from a manhole to the conduit in the city of Paterson in which the Paterson, Passaic & Suburban Telephone Company laid its wires. She brought suit against the telephone company to recover damages for the injuries sustained and secured a verdict in the lower court. The trial judge instructed upon the theory that a structure such as that of the defendant, when laid under the surface of a public street, was liable to become filled with explosive gases, and that therefore reasonable prudence required the making of suitable provision for freeing these subways from all such gases, and that the failure of the defendant to provide proper vents for the escape thereof contributed to the plaintiff's injuries, and was actionable negligence. The decision of the lower court has been reversed by the Supreme Court of New Jersey and the case sent back for a new trial on the question of negligence. The Supreme Court took the position that, so far as the evidence showed, it could not be determined whether the gas had accumulated in the conduit as a natural condition attendant upon excavations of a like nature, or whether it was due to the negligence of the gas company in permitting its escape from its pipes and mains, and that, "in order to justify the conclusion that the defendant was bound to take precautions against the accumulation of illuminating gas in dangerous quantities in its conduits and manholes, it was incumbent on the plaintiff to show by competent testimony that such gas will escape from the mains or service pipes into the adjacent soil, and so into structures like the defendant's subway, notwithstanding reasonable effort to prevent it from doing so, and that the defendant knew, or by the use of reasonable care would have known, this fact."

RIGHT OF WAY THROUGH CITIES.

The New Jersey Telephone Company a through line was built into the borough of Bound Brook, N. J., in part on private property by permission which might at any time be withdrawn and the through line interrupted. The company desired to connect the part built with an already existing through route and applied to the mayor and council of Bound Brook to designate the route through the streets of the city as provided for by the act of 1888 relating to telephone companies. The request was refused and the company secured a writ of mandamus from the Supreme Court of the state requiring the mayor and council to designate the route, the Supreme Court holding that the act of 1900 (P. L. p. 74) does not confer any discretion upon a municipality upon application of a telephone company to have designated a route for a through line.

SERVICE OF COMPETING LINES.

The Kentucky Supreme Court has recently handed down a decision affecting the rights of a subscriber to service of competing telephone systems. J. B. Wisdom was engaged in the "messenger business in city of Owensboro and had entered into a contract with the Harrison Telephone Company, at an agreed price, the telephone company agreeing to place one of its instruments in his office and give line connection with its other subscribers, furnishing him a good telephone service for a period of three years.

Wisdom also had placed in his office an instrument of the Cumberland Telephone Company, the latter company operating a rival line in Owensboro. He was accustomed to notify persons over the Harrison line of calls for them at the Cumberland exchange.

The Harrison Company objected to this custom and removed their phone from Wisdom's office. Wisdom brought suit to recover damages for the injury to his business by reason of the failure of the Harrison Company to complete their contract and secured a judgment for $300.00 against the Harrison Telephone Company. This judgment was sustained by the Supreme Court of Kentucky. In passing on the case the Court said, "the character of the messages delivered by plaintiff over its telephone for the Cumberland was a legitimate and rea-

sonable use of it. Had the plaintiff undertaken to deliver the messages themselves sent over the Cumberland to the recipient perhaps it would not have been a reasonable use."

USE OF POLES BY CITY—LICENSE OF EMPLOYES.

The Boston Electric Light Co., the successor in title to the Citizens Electric Light Company, is a corporation engaged in furnishing light and power in the city of Boston and maintains lines of wires some of which are attached to poles on the public streets and some, as in the case under consideration, are attached to poles upon the property of city. The Citizens Electric Light Company had secured permission from the city to erect poles in the street on condition that the city might maintain a cross bar on each pole for the use of its fire-alarm department. The Electric Light Company and the city had also permitted on request an interchangeable use of all poles erected by the respective parties without a monetary consideration. For the use of poles erected in the streets no requests were made by the fire-alarm department. The company had erected five poles upon the reservoir lot of the city under a license from the water board of the city. On the fifth pole were two cross bars, the upper one having been placed there by the fire- alarm department and to it were attached two fire-alarm wires. While lawfully working on this pole, one, Barker, an employe of the fire-alarm department, was injured through alleged negligence of the Electric Light Company in the maintenance of the pole. Suit was brought to recover damages for the injury, and the question of the liability depended mainly upon whether or not Barker, being there as an employe of the fire-alarm department, was there as a mere licensee. Upon this point the Supreme Court of Massachusetts held that whether plaintiff was a mere licensee or not, and whether the defendant was bound to use reasonable care for his protection were questions for the jury.

COMPETITION AS A FACTOR IN TELEPHONIC PROGRESS.

BY HARRY S. COYLE.

"One venturous game my hand has won to-day,
Another, gallants, yet remains to play."

—Odys x, 5.

Monopoly is as old as the human race, combination is not a new idea. The initial idea of combination—the germ of monopoly—found its lodgment in some brain existing at an epoch far beyond the limits of history. In the intricate complexity of things around him, man strives after the knowledge of the general laws which shall bring them into a harmonious relationship. Only by the assurance of the deep necessity for such a connection can he calmly and clearly survey the apparent arbitrariness of the separate interests. The farther man advances, in the course of time, on the path of progress, the clearer stand out his duties to his fellow beings. Throughout all history man, from his own consciousness, has recognized the controlling motive for the welfare of the race to be higher than personal ambition, and no science nor philosophy has yet succeeded in banishing this thought from his mind.

My theme is to tell how the motive of welfare for the race in ancient monopoly has been superseded by the motive for personal ambition and greed in the modern monopoly, and to show how competition is destroying this corruption through human endeavor. It would be a long, but an interesting story to describe the bitter and fierce struggle that has been wagered at all times by men of all races, savage as well as civilized, against monopolies, and the weapon of this struggle was competition, which has as many branches and motives as human caprice could suggest. The fierce competitive struggle that was wagered in Wall street on May 9, 1901, is still fresh in our memory, although it is but a page in the vast history of this competitive warfare. Vast fortunes—the creations of a lifetime—were swept away in a single hour, and what was the misery and suffering that attended this effort to crush a competitor? Combinations to wreck and destroy competition should be made impossible. There is no individual or race so low in the scale of social being as to be utterly devoid of a desire to do some act or to produce some implement better than his neighbor, and this is a universal characteristic of the human race, and this characteristic feature is called "competition."

Competition has its origin in misery and discontentment. It is the endeavor of mankind to improve his social condition; it is the endeavor of mankind to liberate himself from a social or an industrial slavery by neutralizing the evil effects of monopolies that the laws of the land permit to exist, or are powerless to remedy. Monopoly has cost the world a hell of misery. Our forefathers struck the death blow to a political monopoly at Lexington, and the Independent telephone movement is doing the same to a commercial monopoly throughout the length and breadth of the land. The whole influence of competition is to war against monopoly, and in this capacity it abolishes the evil that makes all that is noble and lovely in human life almost impossible. Competition is a means to an end, and its mission is to end the rule of an industrial despotism. Competition is a factor which profoundly effects mankind through his industries and institutions. Competition is the friend of the masses; it is a powerful instrument in their hands, with which they are destroying the evil, the bad, the greedy, and the menacing forces that are threatening their liberty.

Competition nourishes the good and the true. Under its guidance the will of the people is made manifest by the growth of the institutions that are maintained for their use and comfort.

Human progress is accomplished only by human endeavor, and human endeavor is competition; it is the endeavor of mankind to produce the best; it is the endeavor of mankind to promote the best interests of the race, and, lastly, it is the endeavor of mankind to secure happiness through the creations of his mind and hands. Time would fail me if I would attempt to tell all that competition has done, is doing and will do through human endeavor to accomplish its mission.

Competition is not the result of one motive, but of all possible motives that would advance the interests of the company. Collect all of the influences and wants that have actuated individuals in their business life, these motives acting on human institutions have caused competition. Competition had its origin in the babyhood of the human race, its mission then was the same as in modern times, while it was perhaps more deadly, the results were the same. The unfit was destroyed; not only was he deprived of all earthly riches, but oftentimes his life also was the prey of the victor.

We must remember that there are two kinds of competition, namely, emulative competition and antagonistic competition. Emulative competition results in human progress, emulative competition is the strife between men for greater excellence—to perform better service for their fellow beings. Antagonistic competition results in human retrogression; it is the strife in which man endeavors to injure his rival, that he may himself succeed; it will receive no consideration here, as it belongs to the past ages, and to the animal and vegetable kingdoms. Man, by his inventions, has emancipated himself from personal competition; he has transferred the struggle from his person to the creations of his hands. He that invents the best telephonic invention is the victor over his fellow inventors, and the world is benefited thereby, the manufacturer that manufactures the best telephone apparatus and installs the best plan is the victor over his fellow manufacturers and the world is benefited thereby; the telephone company that gives the best service to its patrons is the victor over its rival, and the public is benefited thereby. Competition teaches man to desire the welfare of his fellows that he himself may share in their prosperity and happiness.

Competition does not consist in the destruction and

ruination of the industrial system of the earth as long as these institutions are maintained for the welfare and benefit of mankind, but let these institutions assume the garb of a monopoly and seek to use its power to rob the people, then competition comes to the rescue of the masses and destroys or corrects the evil by creating a choice for the public between the good and the evil, and the conditions are reversed, the oppressor is oppressed and the good is exalted. The telephone has come down the streams of time freighted with all human emotions, bringing with it in its capacity as a messenger joy and sadness, hope and fear, courage and cowardice, glory and shame, and these are the offspring of competition, for all joy and all sadness are the result of human endeavor.

In 1891 the fundamental patents of the telephone that gave the American Bell Company the power of a monopoly expired, and with the dying breath of this power was born the bright and promising spirit of independent telephony. Telephony is no longer chained and imprisoned in the bastile of monopoly, for, freed of its chains, it has sung its song of liberty to a delighted and appreciative multitude.

Up to 1897 very little progress was made in establishing factories, but this was the preparatory stage through which all of the sciences and arts must pass.

When we see what competition has accomplished in the last decade, and remember the conditions under which the pioneers in this movement labored, we begin to realize the magnitude of their undertaking and the gigantic achievements which they have accomplished, and wonder what will be the ultimate results of this reform movement; however, we may rest assured that it will be in harmony with the welfare of the race. The history of the Independent telephone movement has been marked here and there by a great period of competitive fermentation, not only with the Bell, but among the Independent telephone manufacturers, which has resulted in a better and cheaper line of telephone apparatus, and the telephone is thus placed in the reach of all. It is no longer an expensive luxury, nor is it limited to the dwellings of the rich. By virtue of its universal use it has become a necessity, and it can be found in the hut as well as in the palace. All Independent companies are organized with one object in view, namely, to compete with the Bell, and this is the essential feature of their franchise, from the standpoint of the public. Competition rises out of the desire to give service to human properties. Competition becomes an endless struggle to please.

In conclusion, let us not forget that a telephone company may have unlimited capital, and all that science and wealth could give it in the way of telephone apparatus, and still the spirit of life be not in it.

The vitalizing principle is in the men and women—both employers and employes—who work within its field. Without this element of life, this union between employer and employe, these things are of no avail. But let these great instruments that science has put into the hands of men receive the spirit of progress through human endeavor, and then indeed shall the realizations of the great inventors and artisans become fulfilled, for human endeavor is only another name for competition. The girls on the switchboards compete with one another to render better service, and there is competition among the linemen, the wiremen, the trouble men, and there is competition in every department of the company. The management encourages this internal competition between its employes and combines this unity of action in every department under one head, from which all of the energy of the company is directed, and it is here that the superlative degree of service and usefulness is studied and put into operation. Let us ask the records of the ages what monopolies have accomplished for the human race. Remotest history and speculation will tell a sad story of the degradation of the unhappy masses and exaltation of the few where this condition of affairs exists—a condition from which the world has with great pains and labor and sacrifice escaped, and will know no more.

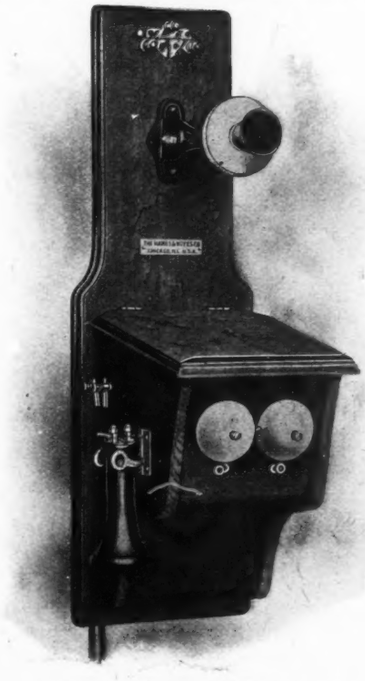
History will tell us a beautiful story of the constant endeavor of mankind to reveal the truth, an endeavor always working for the progress of the good, always neutralizing the tendency to evil, always vast in uplifting the true, the beautiful, and the noble attributes of life, and, strange to say, this endeavor is competition, and competition leads to perfection, and perfection is the only road to happiness.

HAINES & NOYES APPARATUS.

Some new and improved telephone apparatus has recently been put on the market by the Haines & Noyes Company. We feel that a description of it would be of interest.

STYLE 5—DESK SET.

This company, which claims to be the first of the Independent manufacturing companies to make "Bell" type apparatus, finds that there was large sale for it, and that the

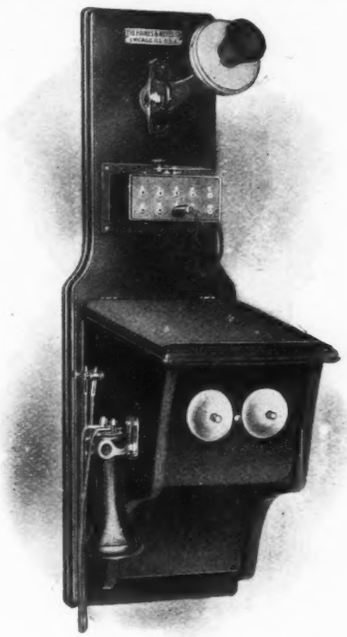


STYLE 11—"BELL TYPE" WALL SET.

demand was and is increasing, and set about to improve their early "Bell" type instruments wherever possible, and

are now turning out telephones which are claimed to contain all the good points of the "Bell" apparatus, but from which they have eliminated all the bad ones. They have also added many new and improved features of their own.

Cut No. 1 shows their latest "Style 5" desk set. This set is heavily nickeled throughout. It is of the "Bell type,"



with a heavy cast base. The upright is of copper. The contacts are all in the base of the instrument and are sure and perfect. They are platinum pointed. In consequence, should the instrument fall or become damaged in any way, the con-

tacts cannot be broken or affected in the slightest degree. Furthermore, by this method all dirt and dust is kept from them and they cannot be corroded.

The transmitter fronts and parts are all heavily cast brass. This is their "5 A" transmitter, which cannot be equaled for volume of sound and clearness of articulation. It may be adjusted to any desired degree.

Bi-polar pony receiver of permanent adjustment, with water shrunk, hard rubber shell. The terminal cords are under one woven cover of silk or worsted. The induction coil is silk wound with fiber ends, and is mounted on fiber base with nickel binding posts. This instrument can be supplied with or without button in base.

This set is furnished either separately or with their special bridging or series generators and ringers; complete for central battery, or with their inter-communicating plug box.

Cut No. 2 shows their "Style 11" "Bell type" wall set. This wall set is but 24½ inches high and is furnished in any kind of wood desired, with high piano finish. It is furnished for series, bridging or central battery use, equipped with their heavily enameled pony arm, with or without induction coil in base. The induction coil is silk wound with fiber head.

The generator box lid lifts up and permits the front of the box to be left down. This gives easy access to all parts of the generators, ringers, wiring, etc.

For central battery they furnish these instruments with or without condensers, according to the system desired and the switchboard used.

The other cuts shown are styles that this company manufacture for hotels, inter-communicating or private telephone plant use.

They have also on the market four different styles of party and grange line telephones for dry or wet batteries.

The Haines & Noyes Company announce that within the next sixty days they will be ready to fill all orders for their new self-restoring switchboard. This board is designed without the use of the old-type drop shutter and is on the visual signal principle. It entirely displaces the old-style drop or falling shutter, and not only makes the work of the operator more positive, but absolutely sure, and greatly facilitates her work, thus gaining two points of great importance, accuracy and time saving. The visual signal appears when a subscriber calls, as a colored indicator, and locks until the operator answers the call by plugging in, which releases the indicator, when the signal immediately disappears. This signal cannot disappear unless the operator answers the call. The signal cannot appear unless a subscriber calls. A sudden jar of the board will not cause a number to indicate, as by the use of the old-style drop.

The jack and signal, which are self-contained and self-restoring, occupy a front space on the board of 1¼ inches by 1 inch, which is exceedingly small—smaller than any other.

STOMBAUGH GUY ANCHOR.

The question of guying poles is one that has greatly bothered the construction man; it has always necessitated a lot of work that at first blush seems useless, and yet is just as important, or even more so, than bracing cross arms. Every means imaginable has been devised to anchor guy wires—from bars of iron driven in the ground, flat plates buried some distance, pieces of trees, cross ties as deadmen, pole stubs and fence posts to complicated and expensive forms.

Within the last year or so the attention of the pole-using public has been called to an exceedingly simple anchor—so simple, in fact, that nearly everyone is disposed to doubt its great holding power until they test it—even the manufacturers doubted and went to a very considerable expense in having a thorough test made by Prof. R. C. Carpenter of Cornell University, which showed the anchors to have an enormous resisting power when bored into the ground from 24 to 60 inches. A full copy of this report is published in a very attractive booklet, entitled "Let Us Cast Your Anchor."

The device to which we refer is termed by the manufacturers "The Stombaugh Guy Anchor." Its simplicity is

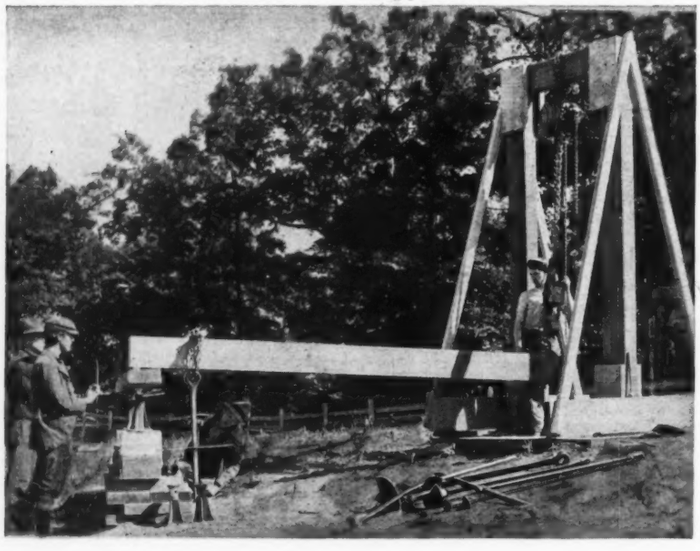


FIG. 1—STOMBAUGH ANCHOR TEST.

in the fact that it has a full cast-iron helix with a point at the lower end, which allows it to be bored into the ground by rotating as you would an auger. These anchors are made in various sizes—3½, 5 and 6 inch—both with and without rods, and 8, 10 and 12 inch, with heavy square rods. A keyed wrench is devised for use in boring all of the smaller anchors into the ground, as the rods on these are not sufficiently heavy to stand the twisting, but it is intended that the larger sizes should be installed, using their own rods, which are sufficiently strong, in lieu of a wrench.

Fig. 1 shows the elaborate apparatus used by Prof. Carpenter in making his test; on advertising page is shown the different styles of anchors, while Fig. 2 shows the anchors in use.

It is claimed that the Stombaugh Guy Anchor gives entirely satisfactory results wherever used, except in very rocky places. Those who have answered our inquiries mention many good reasons for adopting these anchors; among others: "Property owners do not object, because we do not have to dig up their lawns," "We can bore them in without digging and get them under barns, fences and sidewalks," "They save us a great deal of time and we find they hold beyond our expectations," etc.

Taken all in all, this is claimed to be one of the best things that has been brought before pole users in years, and is likely to come into general favor.

STROMBERG-CARLSON FACTORY.

The Stromberg-Carlson Telephone Manufacturing Company has purchased the building which it occupies at the southwest corner of Jackson Boulevard and Clinton Street, Chicago, the purchase price being $212,000. The building is a modern eight-story structure 150 by 100 feet and was built for manufacturing purposes. It has a floor space of 120,000 square feet. This with the adjoining building gives the company approximately 200,000 square feet of floor space. The company is re-equipping both buildings and will employ about one thousand men, over seven hundred now being employed. The company manufactures every thing it uses from the raw material and has a complete wood-working department, insulating and cable plant, foundry, etc., besides a complete telephone manufactory.

NEW MANUFACTURING COMPANY.

The Monarch Telephone Manufacturing Company, Chicago, Ill., of which John E. Norling is president, Ernest E. Yaxley treasurer and general manager, and J. C. Hubacher vice-president and secretary, is placing on the market a complete line of telephone and exchange supplies. Both Messrs. Yaxley and Hubacher are old-time telephone men. Mr. Yaxley commenced with the Western Electric Company in 1887. He spent two years in designing and expert work on the Strowger Automatic System. In 1892 he started and was president of the Phœnix Telephone Manufacturing Company. Organized the Victor Telephone Manufacturing Company in 1898 and brings to his present company the accumulated experience of years. The company invites correspondence from exchange men.

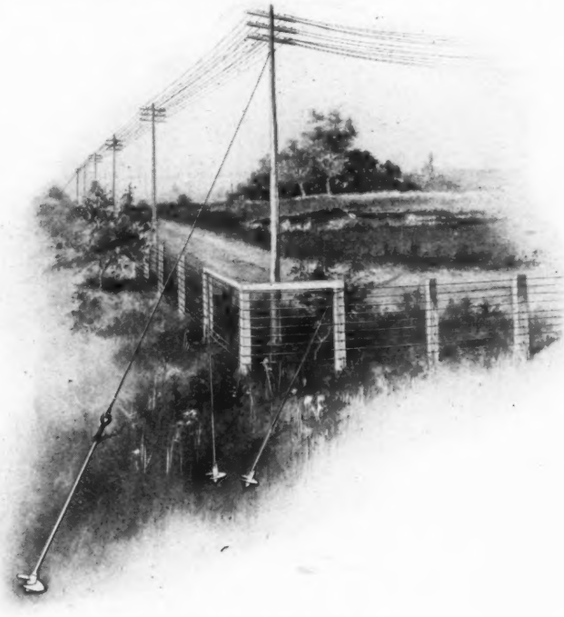


FIG. 2—STOMBAUGH ANCHOR IN USE.

AMERICAN BATTERY COMPANY.

The American Battery Company of 172-174 South Clinton street, Chicago, states that it has equipped two hundred and eighteen central battery telephone exchanges with its storage cells. Its ad. page shows the company's type C elements in lead-lined tank. The company further announces it will have a battery plant in operation at the Pan-American Exposition, Buffalo, being part of the power equipment of the American Electric Telephone Company. Exchange men are invited to inspect the exhibit. The company has just issued a catalogue and revised price list of its product, which will be mailed free upon request.

Want Advertisements.

Want advertisements not exceeding twenty words, exclusive of address, will be inserted in these columns for $1.00 each. If over twenty words the rate will be five cents per word.

POSITION--By a practical telephone man. Thoroughly understands instruments, switchboards and line construction. Experienced in soliciting, installing and managing. Address "PRACTICAL," care Telephony.

POSITION—By good, practical, up-to-date telephone man as manager of telephone exchange. Salary $100 per month. Prefer Southern city. Good references furnished. Address "MANAGER," care Telephony.

POSITION—By up-to-date telephone manager of exchange, Southern city preferred. Address G. L. S., care Telephony.

PARTNER, or company with some money to extend and complete an A1 Mutual Telephone plant in Iowa. All new and paying 18 per cent. We invite close investigation. Or would not object to going into a mutual consolidation on equitable terms, which we believe could be effected and made to pay in our vicinity. Address "TELEPHONE," care Telephony.

FOR SALE—Second-hand Telephones and Switchboards of various makes, low prices. Address "SALESMAN," care Telephony.

FOR SALE OR EXCHANGE—A telephone man owning 30 acres of desirable garden and fruit land, adjoining a prominent Southern city, would like to exchange same for a telephone exchange in good town, or will sell the land at a reasonable price. No better location in the South. For particulars address No. 30, care Telephony.

LOCKE
No. 6.
Porcelain Telephone Insulator.

WORTH YOUR WHILE TO KNOW

THAT THIS IS . . .

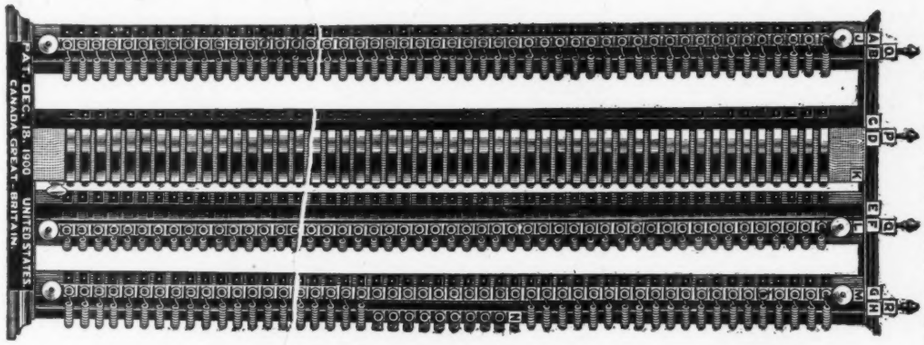
Stronger
Better Insulation } **THAN**
More Economical } **GLASS.**

MADE OF HIGHEST GRADE, ABSOLUTELY NON-ABSORBENT LOCKE PORCELAIN. PRICE IS RIGHT.

FRED. M. LOCKE, Victor, N. Y.

Send for Circulars No. 8 and 10.

TELEPHONE PROPERTY IS AT LAST MADE SAFE.



WHAT THE INVENTION ACTUALLY ACCOMPLISHES.

On the 18th day of December, 1900, the United States Government granted a patent to the undersigned which in the opinion of every practical man who has examined it, is the safest, surest and most complete protection to electrical apparatus, and more especially to telephone switchboards and telephone property generally, that has ever been attempted. This patent is known as an "ELECTRICAL SWITCH," patent No. 664,061, and has recently been patented in foreign countries.

First: Instead of the universal annoying disadvantage of the uncertain contact of the old style screw and washer, a certain safe and sure contact is secured.

Second: All practical men realize that no lightning arresters nor diverters of high pressure currents give perfect immunity from damage and destruction to switchboards and telephone property; this device makes all such property as safe as any other property. Under the old style, the tedious labor, and the long time required to disconnect the conductors, made it practically impossible to do so, and for these reasons failed absolutely, to avert serious loss. The damage in nine cases out of ten had been sustained before the switchboards could possibly be disconnected. With this switch one thousand subscribers can be easily disconnected within ten seconds, and every conductor grounded, making the telephone property as well as the building perfectly secure. Another strong feature of the invention is that every conductor can be as quickly connected as disconnected, requiring no loss of time whatsoever. The switch is as readily attached to metallic circuits, as to common returns, and ground and wire.

Third: The very strongest feature of this important invention, and the one of paramount importance to all telephone property holders, is the quick and sure means to shield telephone property positively and without doubt from the storm, and to obviate terrific damage and often absolute destruction, for however appalling the storm, and however distressing the anxiety and the solicitude for the exchange, the most obtuse and inexperienced operator can instantly disconnect and ground every conductor of the exchange. Again, we care not what voltage from arc circuits or from trolley lines are poured into the exchange, this switch diverts the currents to earth, and all is safe. This fact being true, it is worth many times more than its cost for the quietude and peace of mind it affords. Surely from a business and commercial standpoint, no exchange can afford to be without this safeguard to valuable property. For further particulars and full explanation of cut and testimonials, address

CHARLES W. SCOTT, Lynchburg, Va., U. S. A.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

FUSE BLOCKS, FUSE WIRE, FUSE LINKS,
LIGHTNING ARRESTERS.

AMERICAN ELECTRIC

NEW YORK: 116 NASSAU STREET.

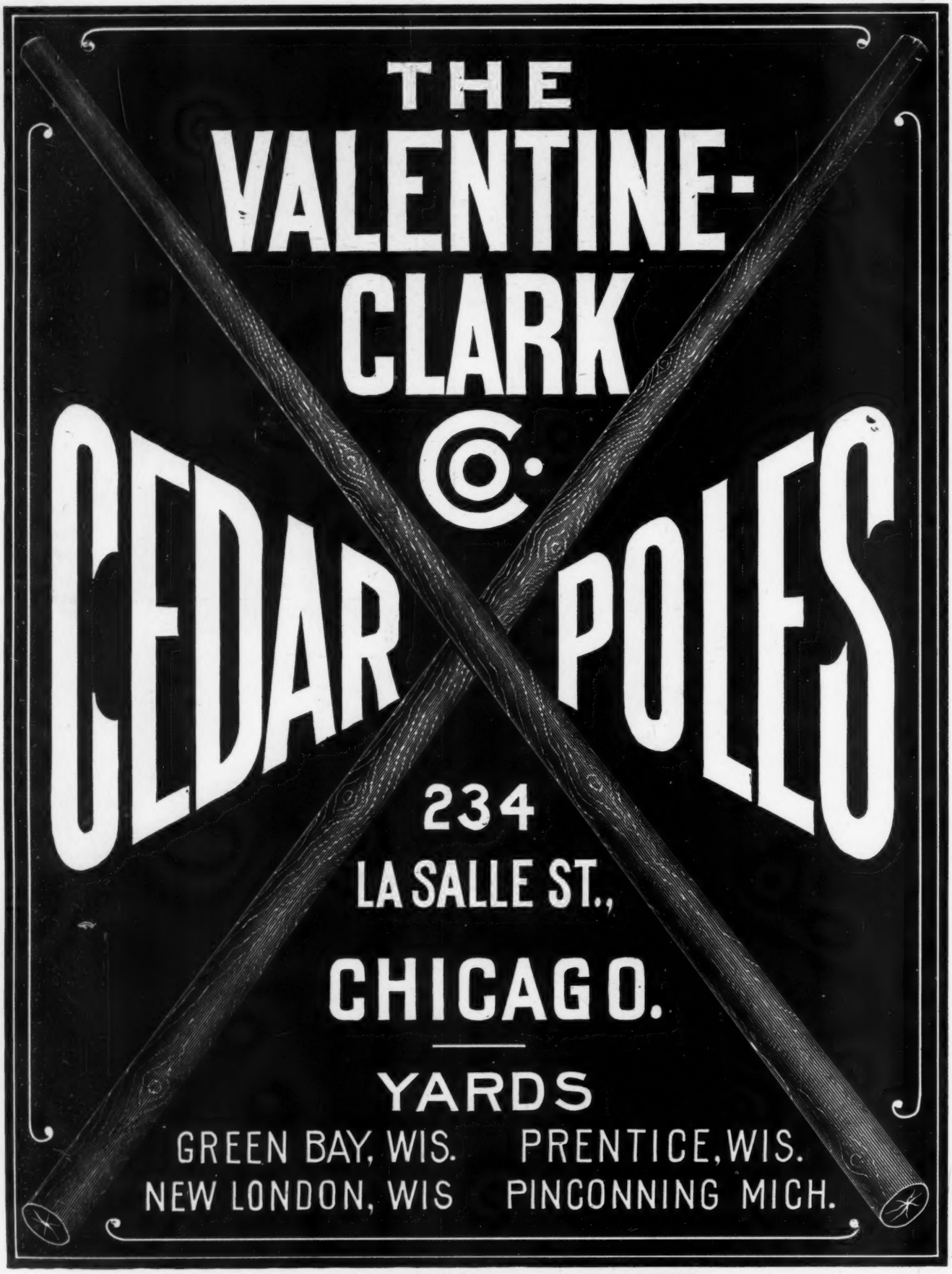
SE

CONNECTORS, INSULATORS, MAGNET WIRE,
DISTRIBUTING BOARDS.

FUSE COMPANY,

CHICAGO: 345-347 S. CANAL ST.

Please tell the Advertiser you saw his Announcement in TELEPHONY.



Please tell the Advertiser you saw his Announcement in TELEPHONY.

CEDAR POLES

PILING AND STREET R. R. TIES.

We Own Large Tracts of Cedar Timber and Produce in Our Own Camps about all the Material we Handle.

C. H. WORCESTER CO.

MARINETTE, WIS.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

CEDAR POLES

WM. MUELLER COMPANY,
CHICAGO.

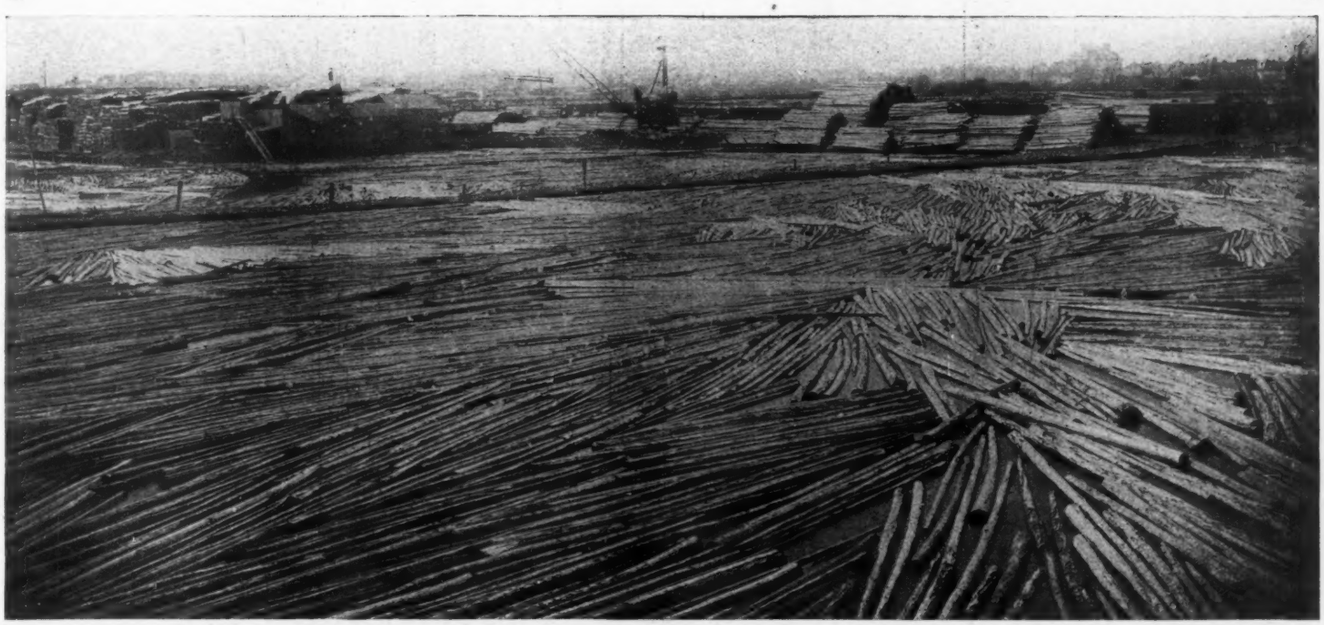
YARDS: Metropolitan. Mich.; Raber, Mich.; Chicago, Ill.; Spalding, Mich.; Flat Rock, Mich.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

RABER & WATSON

293 DEARBORN ST.

CHICAGO.



Above Illustration Shows Our Menominee, Mich., Yard.

CEDAR POLES

YARDS:

CHICAGO, ILL., MENOMINEE AND CHEBOYGAN, MICH.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Carney Brothers Company

CEDAR POLES

GENERAL OFFICES
610 CHAMBER OF COMMERCE
CHICAGO.

YARDS.

DULUTH, MINN. WASHBURN, WIS. CORONA, MINN.
BALL CLUB, MINN. DEER RIVER, MINN. BRULE, WIS.
COHASSET, MINN. GOWEN, MINN.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Your Supply House Will Furnish

STOMBAUGH GUY ANCHORS.

THE CHEAPEST DEVICE FOR ANCHORING. THE BEST.

Experience proves the Rod Anchors to give the best results.

Always order WRENCH

for 3½, 5 or 6 inch Anchors with or without rods.

WE GUARANTEE SATISFACTORY RESULTS.

W. N. MATTHEWS & BROTHERS, DISTRIBUTORS,

505 Carleton Building, ST. LOUIS.

JOHN H. FOWLER
FISHER BUILDING,
CHICAGO.

CEDAR POLES

LARGE STOCK.
PROMPT SHIPMENTS.
LONG POLES A SPECIALTY.

W. T. REYNOLDS,

1029-30 LUMBER EXCHANGE,
MINNEAPOLIS, MINNESOTA.

WHITE CEDAR POLES

ALL SIZES.
PACIFIC COAST POLES.
40 TO 80 FEET.

W. C. STERLING & SON,

MONROE, MICH.
11 POLE YARDS IN MICHIGAN.
WHOLESALE PRODUCERS FOR 20 YEARS.

CEDAR POLES

Cedar

Lindsley Brothers Company
MENOMINEE, MICH.
YARDS:
Menominee, Mich. Stephenson, Mich.
Goll, Wis. Portland, Ore.

Poles

Cedar Poles

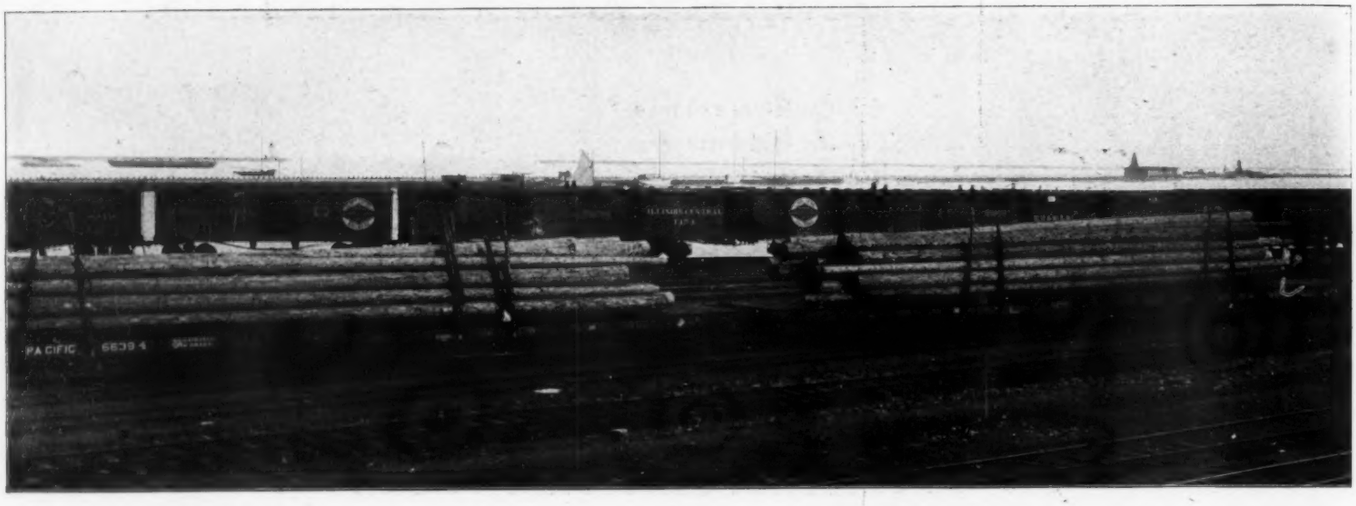
O. W. SMITH

223-225 DEARBORN ST.,
CHICAGO, ILL.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

CEDAR POLES.

LARGE STOCK. PROMPT SHIPMENT.



LONG POLES A SPECIALTY. **John H. Fowler, Chicago,** FISHER BLDG.

WE USUALLY GET A SECOND ORDER
FOR OUR
TELEPHONE POLES

BECAUSE our prices are low, our stock large and we ship promptly. Our only trouble is in getting the cars. We are just unloading a boat load of poles at our Detroit yard and have four more to come (and this is only one of our yards).

NO TROUBLE ABOUT HAVING THE STOCK NOW.
PERMIT US TO QUOTE YOU.

MALTBY LUMBER CO., Bay City, Mich.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

A.P. Hopkins & Co.

ESCANABA, MICH.

CEDAR POLES

BEST POLES.
PROMPT SHIPMENTS.
FAIR PRICES.
WRITE US.

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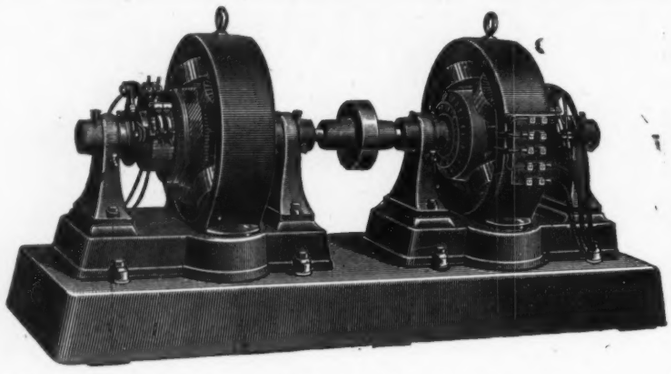

The H.-C. Telephone Dynamo for direct connection to transmitter circuit. No noise audible due to commutation; can be used without storage battery; the only thing to use for common battery system. We should be pleased to send full particulars on application. We also manufacture a complete line of Power Generators and Motors for telephone service, either for charging storage batteries or operating signals. If you will tell us what you wish to do in the way of signaling, we can tell you of a machine that will produce the results desired by you to the best advantage.

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Make sure that you have the genuine "Holtzer-Cabot" signaling equipment on your telephones. Our long experience in this line of work is a guarantee that our apparatus shall be both efficient and lasting.

The Holtzer-Cabot Electric Co.

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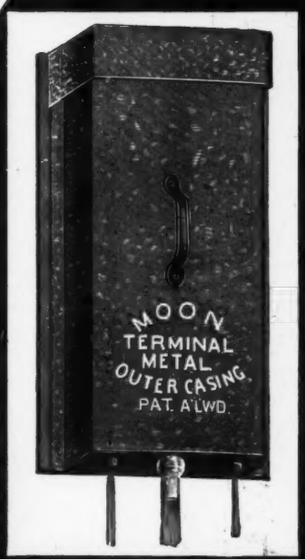
Moon Terminal Head



The Moon Terminal Head, with Metal Outer Casing, showing that it is possible to place The Moon Terminal Head at any desired place on the pole, to advantage, owing to the fact that the door for outer Casing slides.

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Electrical Construction Supply Company,

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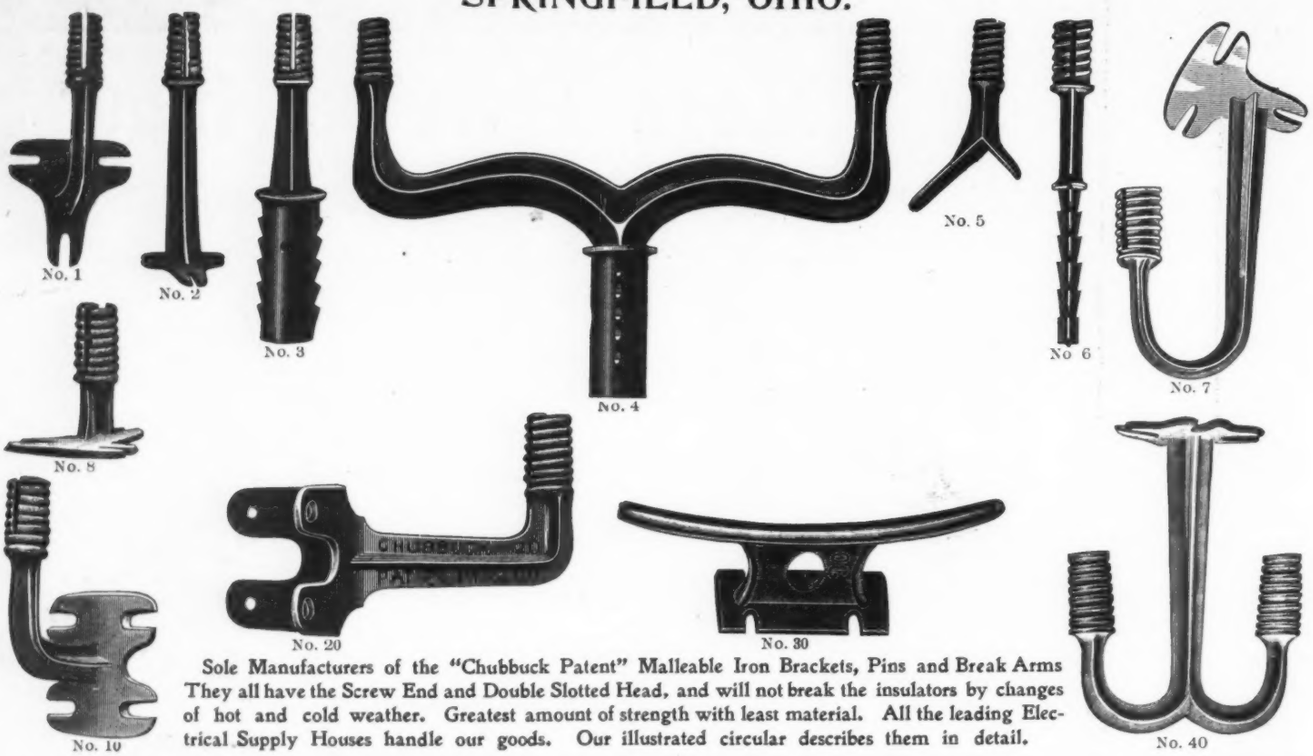

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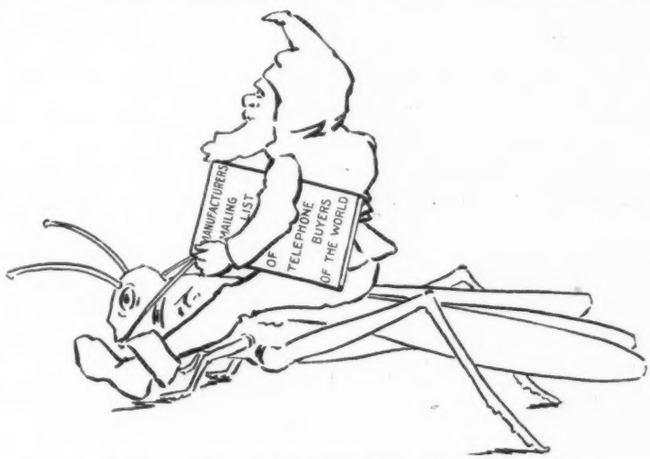
IN THE UNITED STATES, CANADA, MEXICO AND FOREIGN COUNTRIES.

This List is used by the leading Telephone Manufacturers, Supply Houses, Pole Dealers, etc., and is the only complete list extant.



It aggregates nearly 10,000 buyers, is classified and alphabetically arranged by states and towns in states. It is "THE ONLY ONE."

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The Independent Telephone Exchanges, Private Exchanges, Principal Toll Line Companies, Construction Companies, Individual Buyers, Supply Houses, Superintendents of Telegraph, Etc.

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Model 17

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Guaranteed for a period of six years in legitimate bridging work. More telephones of this model are in use to-day than any other style of bridging telephone on the market.

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Everyone will soon know

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The latest product of the great

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Guaranteed for a period of six years on overloaded lines. If your telephone line is overloaded this telephone will fill a long-felt want.

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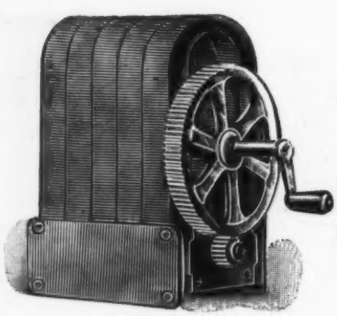
OUR LEADER.



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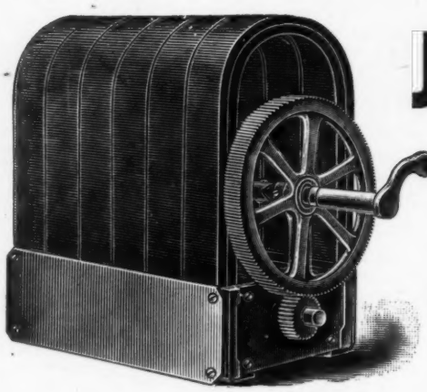

JUMBO

Bridging Generator

No. 2

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CHICAGO BRIDGING TELEPHONE, MODEL 25.

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Special attention given to Machines for Telephone Switchboard work.

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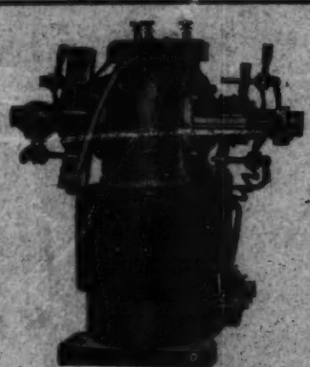

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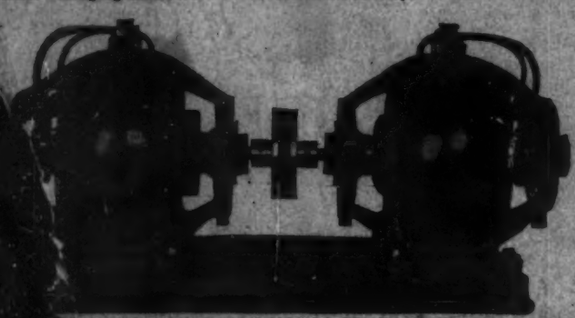

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